Appendix C. Data Sources

Table C1. Data Sources for Upper Owyhee Watershed Subbasin Assessment.

Water Body	Data Source	Type of Data	When Collected
Deep Creek, Nickel Creek, Pole Creek, Castle Creek, Red Canyon Creek	Idaho Department of Environmental Quality, Boise Regional Office	Temperature	2000 and 2001
Battle Creek and Shoofly Creek	Idaho Department of Environmental Quality, Boise Regional Office	Bacteria	2000 and 2001
Juniper Basin Reservoir and Blue Creek Reservoir	Idaho Department of Environmental Quality, Boise Regional Office	Turbidity	2001
Pole Creek, Castle Creek, Deep Creek, Nickel Creek	United States Department of Interior, Bureau of Land Management	Fish	1999-2000
Various Streams in Watershed	Idaho Department of Environmental Quality, Boise Regional Office	Beneficial Use Reconnaissance Program Data	1991-1998

Appendix D. Stream Segment Temperature Model (SSTEMP) and Hydrology Model

Modeling Approach

SSTEMP and SSSHADE were the models used to assess the effects of solar radiation, channel morphology and instream flow on temperature in stream segments of the Upper Owyhee Watershed. The models were developed to help predict the consequences of manipulating various factors influencing water temperature. SSSHADE is a stream shading model which is used to provide input variables to the SSTEMP model. SSSHADE estimates stream shading from various riparian (vegetation) and topographic conditions

SSTEMP and SSSHADE require input data for 28 parameter and state variables ranging from channel conditions to climate. Many of these were kept constant for all model runs. Several parameters were varied to assess the impact of various factors. The following is a model input parameters are described below.

Input Values and Model Calibration

Stream Network Hydrology:

Segment Inflow: For all situations with streams with headwaters, this value was set at zero. For segments streams that are confluence of two streams this value was set at the addition of the flow from both water bodies. Flow was determined with the use of the flow model developed by Hortness and Berenbrock (2001). The flow model will be discussed later.

Inflow Temperature: For all situations with streams with headwaters, this value was set at 8.3^{o}C. For streams that are confluence of two streams this value was set based on the flow from both water bodies and the following formula:

$$T_j = \frac{(Q_1 * T_1) + (Q_2 * T_2)}{Q_1 + Q_2}$$

where: T_j = water temperature below junction
Q_n = discharge of source n
T_n = water temperature of source n

Stream Outflow: This value was obtained by calculating the inflow through the discharge model (Hortness and Berenbrock 2001). There is no allowance for reaches that are losing or gaining reaches. Thus, discharge is a steady state where outflow equals inflow from the beginning of the reach plus any inflow determined by the hydrology model.

Accretion Temperature: This the expected ground water temperature. This value is calculated by determining the average yearly temperature. Using the average yearly temperature obtained from the National Weather Service at the Boise City Municipal Airport (Boise, Idaho), a ground water temperature of 8.3^{o} C was obtained. To calculate the difference in the average yearly temperature the following formula was used:

$$T_a = T_o + C_t * (Z - Z_0)$$

where: T_a = average yearly air temperature at elevation E (^oC)
T_o = average air temperature at elevation Eo (^oC)
Z = Mean elevation of segment
Z_o = elevation at station (Boise)
C_t = moist adiabatic lapse rate (-0.00656 $^oC/m$)

Stream Network Geometry:

Segment Lengths: Derived from the stream reach length from GIS coverages.

Latitude: Used 0.733 radians (42.0^o) for all segments representing the lowest latitude of the study area.

Dams at Heads of Segments: No dams were figured into the model.

Upstream Elevation: Determined for each stream reach from USGS 7.5-minute quad maps.

Downstream Elevation: Determined for each stream reach from USGS 7.5-minute quad maps.

Width's A Term: The initial value was determined with the model. The width/depth ratio was set near 25 for all streams. The width/depth ratio was set at this value based on the limited BURP data. Width was then calculated through the model based on discharge (flow) input and calculated stream gradient. The width value was changed to obtain a possible width/depth ratio of near 12 to obtain a possible value once stream morphology conditions improve in response to changes in riparian vegetation and streambank conditions.

The use of the wetted width is an accepted input parameter if the stream width is not varied during the model run (Bartholow 1999). If wetted width is used, then the width's B Term is zero.

B Term where W = A*Q*B: This input is a calculated formula using available flow data. With limited flow data for the Upper Owyhee Watershed, this value was set at zero.

Manning's n: A default value of 0.035 was used because of the variability of substrate in the Upper Owyhee Watershed. The substrate varies from sand-silt to large boulders. The gradient can vary from 1-6%.

Stream Network Meteorology:

Air Temperature: The daily mean air temperature for the month of June was calculated from the mean daily temperature from the National Weather Service in Boise, Idaho. The Boise mean daily air temperature was used due to the fact that field data temperature loggers could not be in place early in the season due to travel difficulties and reluctance to leave data loggers out through the winter. To compensate for the possible difference in air temperature from Boise to the Upper Owyhee Watershed, the following formula was used:

$$T_a = T_o + C_t * (Z - Z_0)$$

where: T_a = average yearly air temperature at elevation E (^oC)
T_o = average air temperature at elevation Eo (^oC)
Z = Mean elevation of segment
Z_o = elevation at station (Boise)
C_t = moist adiabatic lapse rate (-0.00656 $^oC/m$)

Daily mean air temperatures for the months of July and August were calculated using temperature data recorded by data loggers in place in the watershed. The ambient air temperature-monitoring site was located at approximately 1,500 meters (4921 feet) elevation near the confluence of Castle Creek and Deep Creek.
Maximum Air Temperature: For the month of June the model calculated the monthly maximum temperature. Once again the lack of data prevented the use of actual in-field data. With the high probability of a wide variance of data from the beginning of the month to the end of the month, it was decided the model would be sufficient for calculating the mean monthly maximum air temperature for June.

For July and August, the actual mean monthly air temperature was used. The ambient air temperature monitoring site was located at approximately 1,500 meters (4921 feet) elevation near the confluence of Castle Creek and Deep Creek.

Relative Humidity: Relative humidity was set at 61.2% for the months of June, July and August. This value was determined sing the average relative humidity obtained from the National Weather Service in Boise, Idaho. The value obtained from Boise was then corrected for elevation using the following formula:

$$Rh = R_o*[1.6040\wedge(T_o-T_a)] * [T_a+273.16)/(T_o+273.16)]$$

where: Rh = relative humidity for temperature T_a
R_o = relative humidity at station T_a
T_a = air temperature at segment
To = air temperature at station
^ = exponentiation

$$0 <= Rh <= 1$$

Wind Speed: The value obtained was from the National Weather Service in Boise, Idaho and averaged for June, July and August.

Ground Temperature: Using the average yearly air temperature obtained from the National Weather Service at the Boise City Municipal Airport (Boise, Idaho) after calibrating for altitude difference the value of 8.3^oC was obtained. To calculate the difference in the average yearly temperature the following formula was used:

$$T_a = T_o + C_t * (Z - Z_0)$$

where: T_a = average yearly air temperature at elevation E (^oC)
T_o = average air temperature at elevation Eo (^oC)

Z = Mean elevation of segment
Z_o = elevation at station (Boise)
C_t = moist adiabatic lapse rate (-0.00656 $^oC/m$)

Thermal Gradient: A default setting of 1.65joules/m^2/second was used.

Possible Sun: This value was obtained from the National Weather Service in Boise, Idaho and averaged for June, July and August. Value set at 76% for all three months of the model run.

Dust Coefficient: The input value was set at 6 units for entire run of the model. The input value range is 3 to 10 as supplied by Bartholow (1999) and taken from Tennessee Valley Authority (1972). The middle value was used as the input value due to a lack of data.

Ground Reflectivity: The input value was set at 15 and represents flat ground and rock (range 12-15). The high value was selected due to bare soils with high amounts of silt and sand in the surrounding soils.

Solar Radiation: Model defined.

Stream Network Shade:

Shade: Model generated based on input values for calibration. Shade then adjusted to obtain WQS criteria. Shade contains both topographic and vegetation shade. Topographic shade determined by value input from topographic attitude. Vegetation shade is then determined by model as shade increases. That is, since the topographic shade is a steady state input, as total shade is increased this would represent an increase in vegetation shade.

Stream Network Optional Shading Parameters:

Shading parameters are optional inputs. For the Upper Owyhee these values were entered during calibration reasons. Most of the values were entered using available data. In most incidences, once the required reductions (Joules/m^2/sec) were calculated these parameters were ignored by the model.

Segment Azimuth: This was determined from USGS 7.5-minute topographic maps. Since most streams have a general north to south flow (headwaters to mouth) this input value was set at zero (0.00 radians) for most streams. Two streams have northwest to southeast and southwest to northwest aspects with the input value set at either +45^o (+(0.785 radians)) or –45^o (–0.785 radians).

Topographic Attitude: This input value was the most difficult to determine and was usually set at 45^o (0.785 radians) due to the steepness of the canyons. In many incidences, this value then converted to a topographic shading factor of 35%. This input value was entered for both the west and east sides of the water bodies. For two streams that do not have steep canyons, the value was set at 10^o (0.175 radians). This value was determined from USGS 7.5 minute topographic maps.

Vegetation Height: Most of the riparian woody vegetation associated with riparian areas in the Upper Owyhee Watershed is of willows (S*alix sp.*). Some of the willow species that can be encountered include whiplash willow (*S. lasiandra*), sandbar willow (*S. longifollia*), and coyote willow (*S. exigua*). Most of these species are low lying shrubs with a canopy height between 7 and 15 feet. To offset for different species, an input value of 10 feet was set as default for vegetation height. In almost all model runs, vegetation shading calculated to be 0%.

Vegetation Crown: Many of the aspects discussed in vegetation height hold true for the vegetation crown. Most of the woody vegetation in the riparian areas Of the Upper Owyhee Watershed is low-brushy species with multiple shoots creating a dense canopy. To offset for different species encountered, input value of ten (10) feet was set as default for vegetation canopy on both the west and east sides. In almost all model runs, vegetation shading was calculated at zero percent (0%).

Vegetation Offset: Vegetation offset is the distance from the center of the water body to the main trunk of the vegetation. This input value was set at 20) feet as a default. Little information is available to assist with providing an accurate estimate. In almost all model runs, vegetation shading was calculated to be 0%.

Vegetation Density: Bartholow (1999) suggested a dense emergent vegetation cover could have a vegetation density 90%. This value was used as the input for vegetation density. It was shown that this factor had little influence on most streams due to vegetation height, crown and offset.

Stream Network Time of Year:

Time of Year: The value was set at the 15th for June, July and August. This computes an average value for a 30 day model run. This value is most important for determining length of day and sun angle.

Output Values

Stream Segment Intermediate Values:

Day Length: This value is determined by the input for time of year and latitude.

Slope: Calculated from input values for elevation change and stream length

Width: This is the same as the width input value.

Depth: Calculated from segment outflow, gradient and depth.

Vegetation Shade: Total shade minus topographic shade. Vegetation shade may vary based on time of year and azimuth inputs.

Topographic Shade: The model calculates this from input for latitude, time of year, azimuth, and topographic attitude.

<u>Stream Segment Mean Heat Flux (Inflow or Outflow):</u>

Convection: Convection component heat flux gain or loss at inflow or at outflow.

Atmosphere: Atmosphere component heat flux gain.

Conduction: Conduction component heat flux gain or loss at inflow or outflow.

Friction: Friction component heat flux gain or loss.

Evaporation: Friction component heat flux gain or loss at inflow or outflow.

Solar: Solar component heat flux gain or loss.

Background Radiation: Background radiation component heat flux gain or loss at inflow or outflow.

Vegetation: Vegetation component heat flux gain or loss.

Net: Net increase or decrease of heat flux from the sum of the above mentioned components.

<u>Stream Segment Model Results-Outflow Temperature:</u>

Predicted Mean Temperature: Model predicted mean daily water temperature in relation to model inputs.

Estimated Maximum Temperature: Model estimated maximum water daily temperature.

Approximate Minimum Temperature: Model approximated minimum daily water temperature (mean temperature - (maximum temperature-mean temperature)).

Mean Equilibrium: Model mean daily water temperature equilibrium if conditions remain the same.

Maximum Equilibrium: Model maximum daily water temperature equilibrium which maximum temperature may approach.

Minimum Equilibrium: Model minimum daily water temperature which minimum temperature may approach (equilibrium mean temperature - (equilibrium maximum temperature - equilibrium mean temperature)).

Model Validation

The model was validated by determining the root mean square error for both the average daily temperatures and the maximum daily temperatures for the months of July and August 2000.

Unfortunately, the available data consisted of only five data points for July and only four data points for August.

The following tables describe the results for validation of the SSTEMP Model and those water temperatures found in water bodies in the Upper Owyhee Watershed. Overall the model has provided a reasonable estimate of predicting current conditions and establishing reasonable guidance for predicting water temperature changes by increasing the amount of shade.

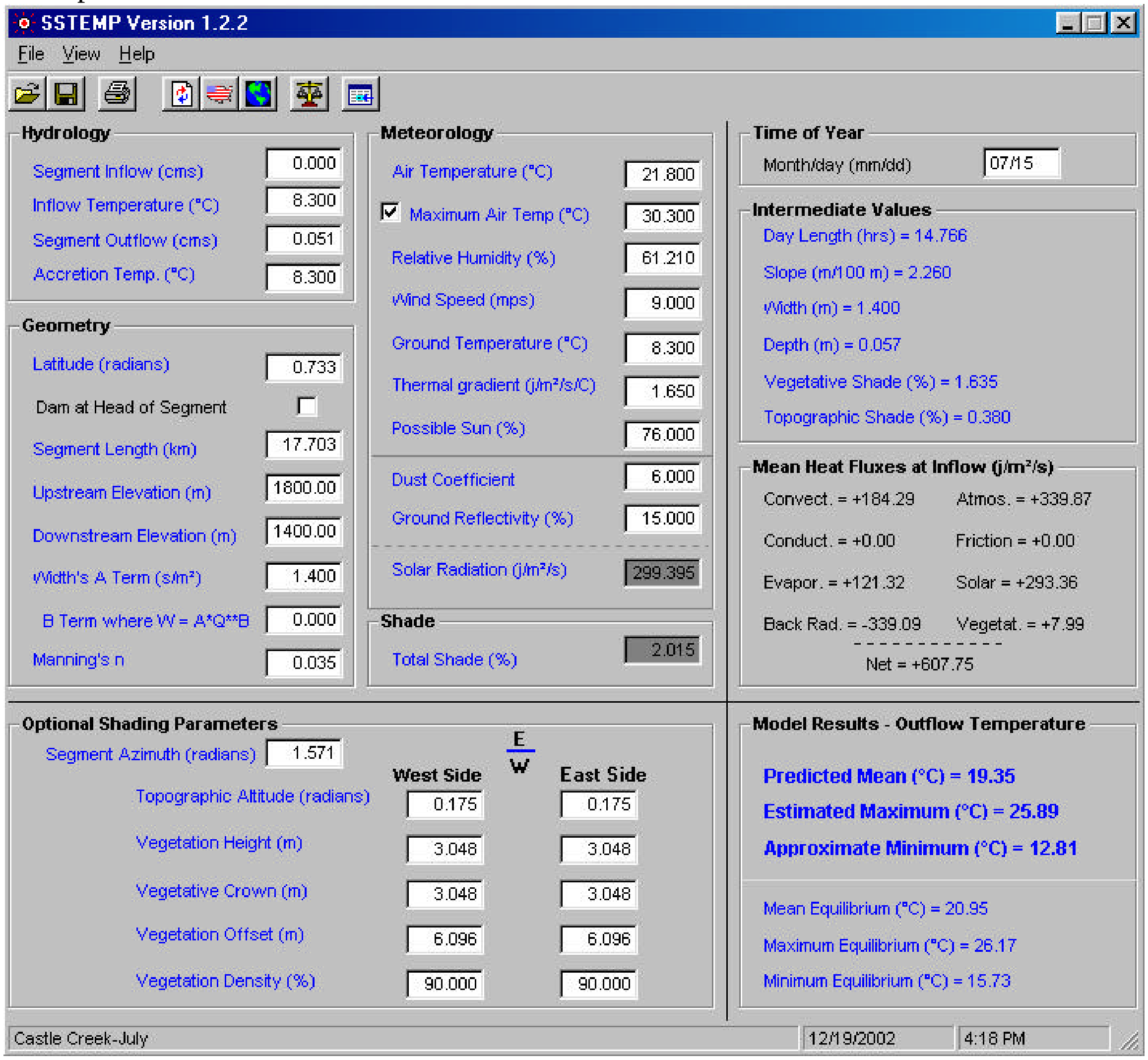
Table D1. Validation Results for July 2000.

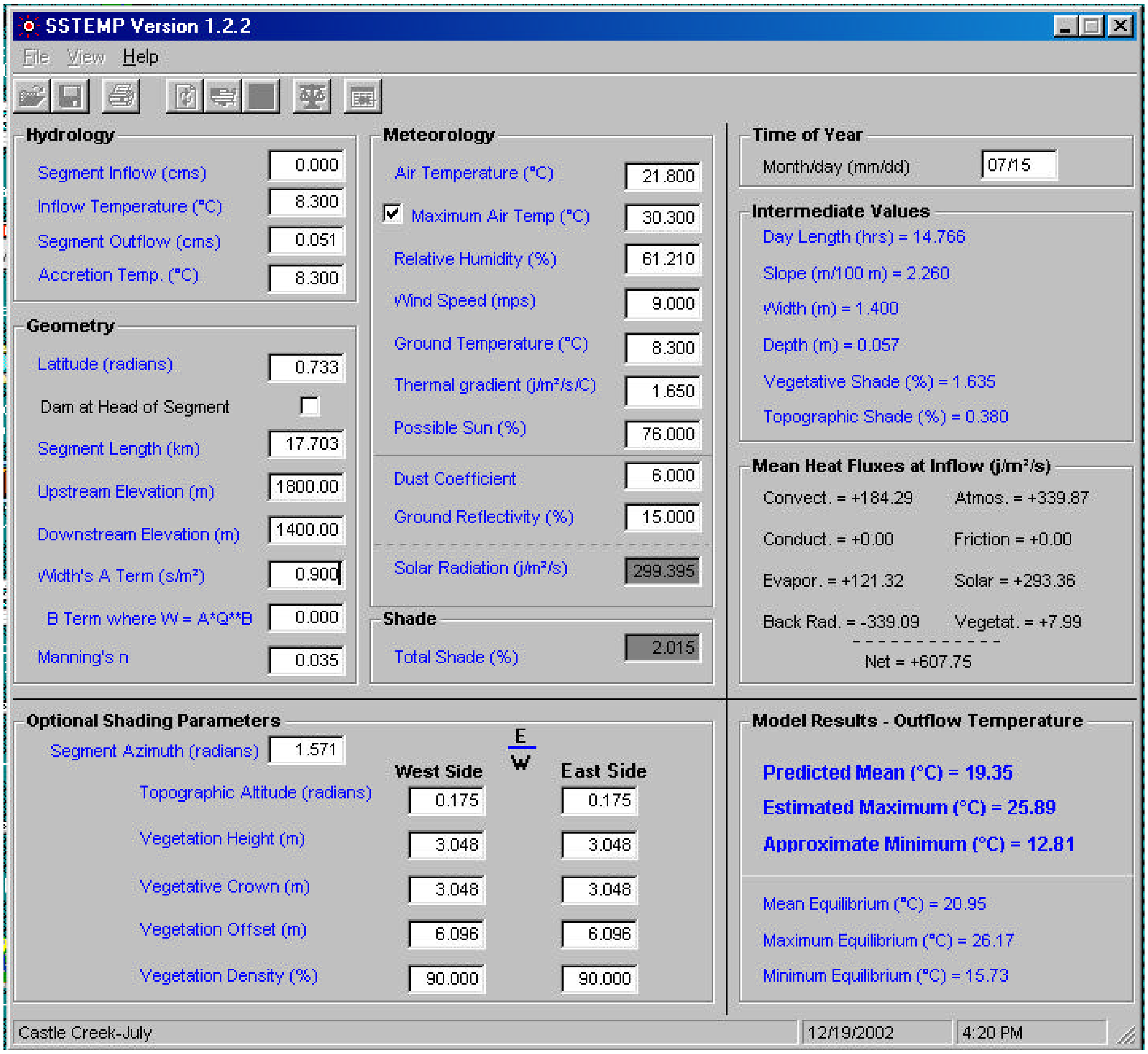
	Actual Measured Daily Average C^{o}	Predicted Daily Average C^{o}	Actual Measured Daily Maximum C^{o}	Predicted Daily Maximum C^{o}
Upper Deep Creek	19.7	19.4	28.1	24.8
Castle Creek	19.7	19.4	28.1	25.9
Upper Pole Creek	19.7	19.2	28.1	25.2
Middle Deep Creek	21.4	19.3	27.9	23.7
Red Canyon Creek	15.8	17.9	19.6	23.8
Average	20.1	19.3	28.1	24.9
		Average	Maximum	
Root Mean Square Error		0.5 ^{o}C	1.6^{o}C	
Relative Error		2.6%	5.6%	

Table D2. Validation Results for August 2000.

	Actual Measured Daily Average C^{o}	Predicted Daily Average C^{o}	Actual Measured Daily Maximum C^{o}	Predicted Daily Maximum C^{o}
Upper Deep Creek	17.9	16.5	24.2	24.1
Castle Creek	18.1	17.2	27.7	25.5
Upper Pole Creek	20.1	17.0	24.3	24.7
Middle Deep Creek	21.4	18.2	25.5	23.3
Average	19.4	17.2	25.4	24.4
		Average	Maximum	
Root Mean Square Error		1.8^{o}C	2.3^{o}C	
Relative Error		9.3%	8.9%	

Examples of SSTEMP Model for Castle Creek

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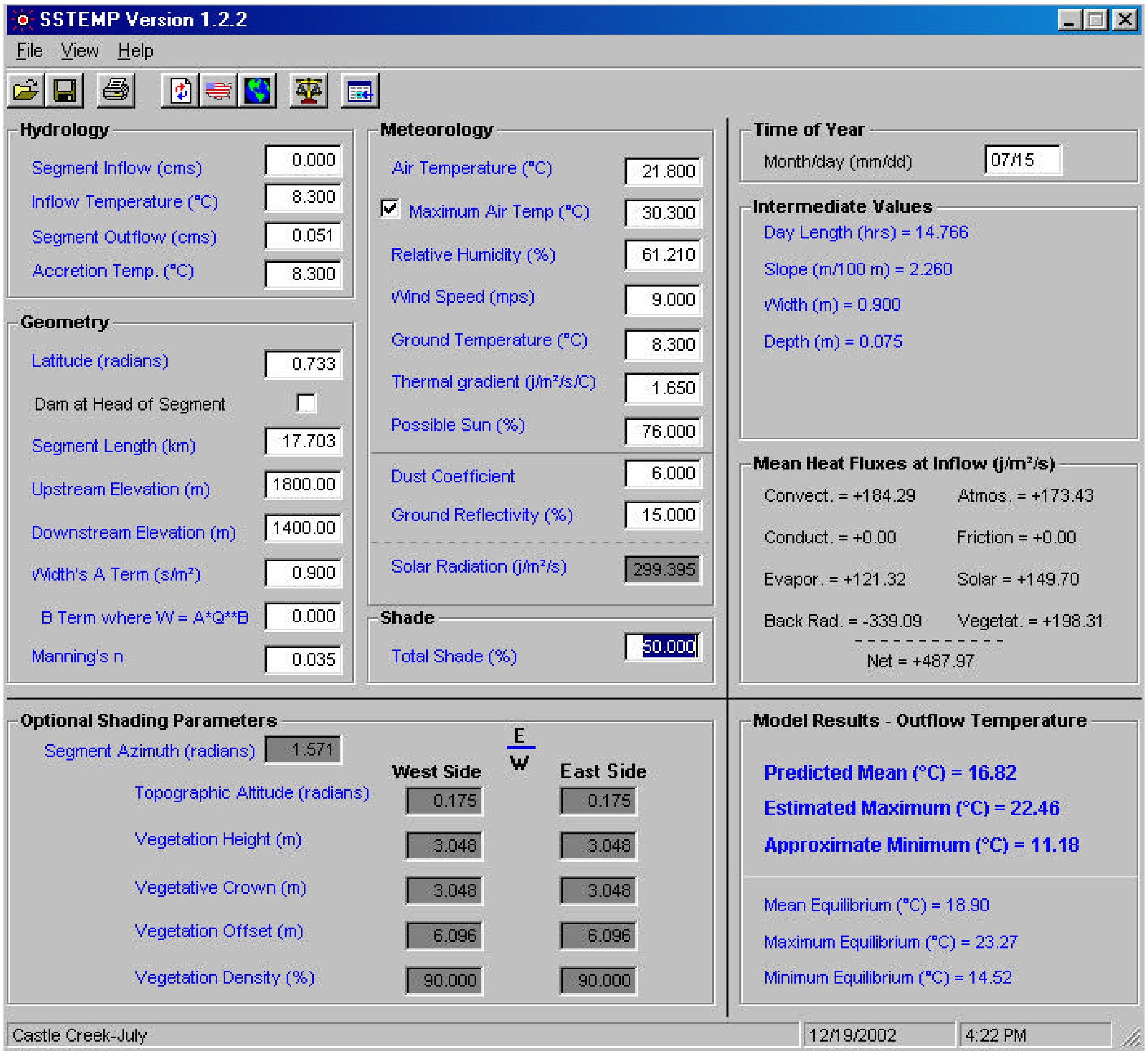
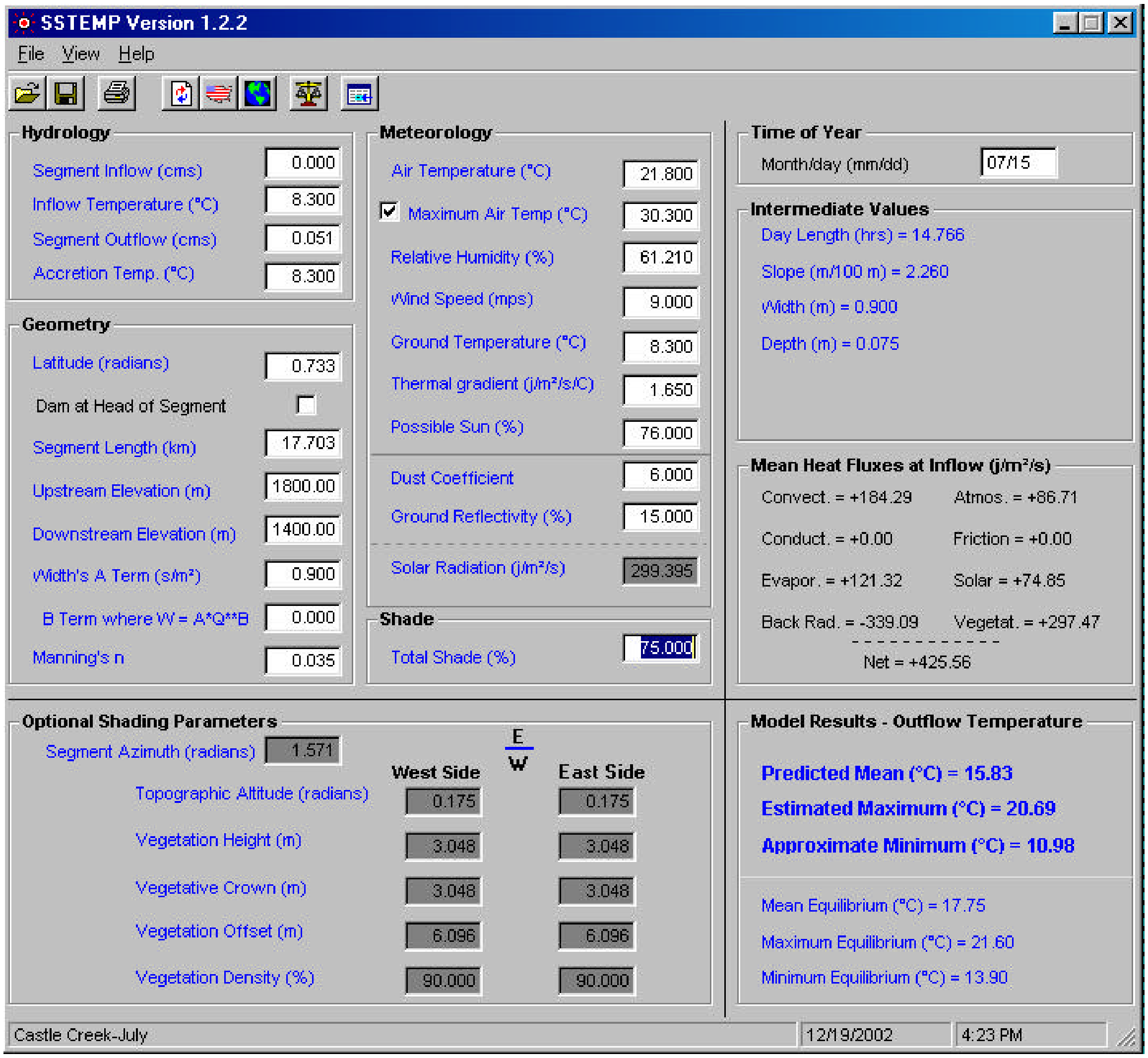
File View Help
Hydrology
Segment Inflow (cms) 0.000
Inflow Temperature (°C) 8.300
Segment Outflow (cms) 0.051
Accretion Temp. (°C) 8.300
Geometry
Latitude (radians) 0.733
Dam at Head of Segment
Segment Length (km) 17.703
Upstream Elevation (m) 1800.00
Downstream Elevation (m) 1400.00
Width's A Term (s/m²) 0.900
B Term where W = A*Q**B 0.000
Manning's n 0.035
Meteorology
Air Temperature (°C) 21.800
Maximum Air Temp (°C) 30.300
Relative Humidity (%) 61.210
Wind Speed (mps) 9.000
Ground Temperature (°C) 8.300
Thermal gradient (j/m²/s/C) 1.650
Possible Sun (%) 76.000
Dust Coefficient 6.000
Ground Reflectivity (%) 15.000
Solar Radiation (j/m²/s) 299.395
Shade
Total Shade (%) 2.015
Time of Year
Month/day (mm/dd) 07/15
Intermediate Values
Day Length (hrs) = 14.766
Slope (m/100 m) = 2.260
Width (m) = 1.400
Depth (m) = 0.057
Vegetative Shade (%) = 1.635
Topographic Shade (%) = 0.380
Mean Heat Fluxes at Inflow (j/m²/s)
Convect. = +184.29 Atmos. = +339.87
Conduct. = +0.00 Friction = +0.00
Evapor. = +121.32 Solar = +293.36
Back Rad. = -339.09 Vegetat. = +7.99
Net = +607.75
Optional Shading Parameters
Segment Azimuth (radians) 1.571
E
W
West Side East Side
Topographic Altitude (radians) 0.175 0.175
Vegetation Height (m) 3.048 3.048
Vegetative Crown (m) 3.048 3.048
Vegetation Offset (m) 6.096 6.096
Vegetation Density (%) 90.000 90.000
Model Results - Outflow Temperature
Predicted Mean (°C) = 19.35
Estimated Maximum (°C) = 25.89
Approximate Minimum (°C) = 12.81
Mean Equilibrium (°C) = 20.95
Maximum Equilibrium (°C) = 26.17
Minimum Equilibrium (°C) = 15.73
Castle Creek-July
12/19/2002
4:20 PM


SSTEMP Version 1.2.2
File View Help
Hydrology
Segment Inflow (cms) 0.000
Inflow Temperature (°C) 8.300
Segment Outflow (cms) 0.051
Accretion Temp. (°C) 8.300
Geometry
Latitude (radians) 0.733
Dam at Head of Segment
Segment Length (km) 17.703
Upstream Elevation (m) 1800.00
Downstream Elevation (m) 1400.00
Width's A Term (s/m²) 0.900
B Term where W = A*Q**B 0.000
Manning's n 0.035
Meteorology
Air Temperature (°C) 21.800
Maximum Air Temp (°C) 30.300
Relative Humidity (%) 61.210
Wind Speed (mps) 9.000
Ground Temperature (°C) 8.300
Thermal gradient (j/m²/s/C) 1.650
Possible Sun (%) 76.000
Dust Coefficient 6.000
Ground Reflectivity (%) 15.000
Solar Radiation (j/m²/s) 299.395
Shade
Total Shade (%) 50.000
Time of Year
Month/day (mm/dd) 07/15
Intermediate Values
Day Length (hrs) = 14.766
Slope (m/100 m) = 2.260
Width (m) = 0.900
Depth (m) = 0.075
Mean Heat Fluxes at Inflow (j/m²/s)
Convect. = +184.29 Atmos. = +173.43
Conduct. = +0.00 Friction = +0.00
Evapor. = +121.32 Solar = +149.70
Back Rad. = -339.09 Vegetat. = +198.31
Net = +487.97
Optional Shading Parameters
Segment Azimuth (radians) 1.571
E
W
West Side East Side
Topographic Altitude (radians) 0.175 0.175
Vegetation Height (m) 3.048 3.048
Vegetative Crown (m) 3.048 3.048
Vegetation Offset (m) 6.096 6.096
Vegetation Density (%) 90.000 90.000
Model Results - Outflow Temperature
Predicted Mean (°C) = 16.82
Estimated Maximum (°C) = 22.46
Approximate Minimum (°C) = 11.18
Mean Equilibrium (°C) = 18.90
Maximum Equilibrium (°C) = 23.27
Minimum Equilibrium (°C) = 14.52
Castle Creek-July
12/19/2002
4:22 PM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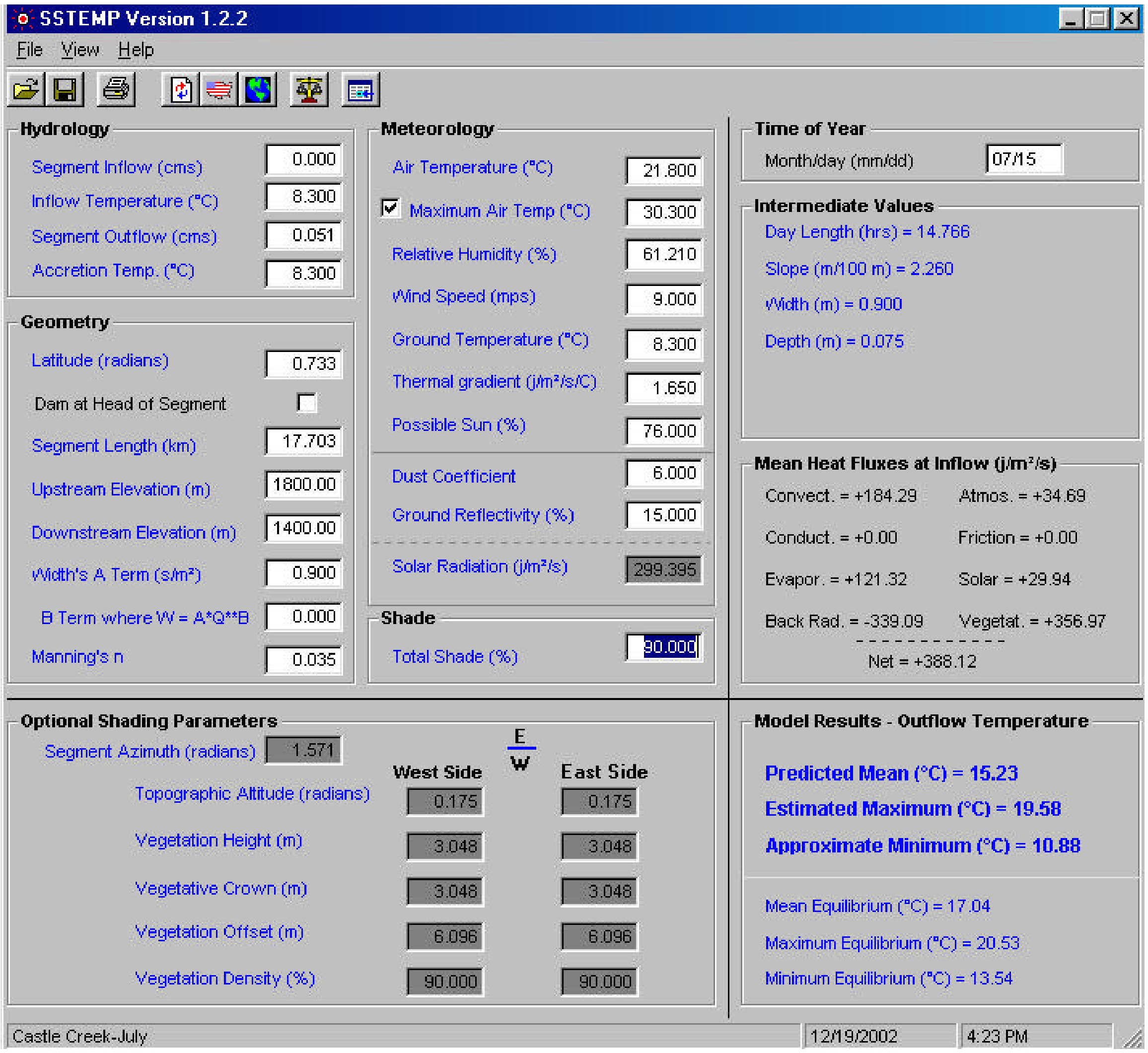
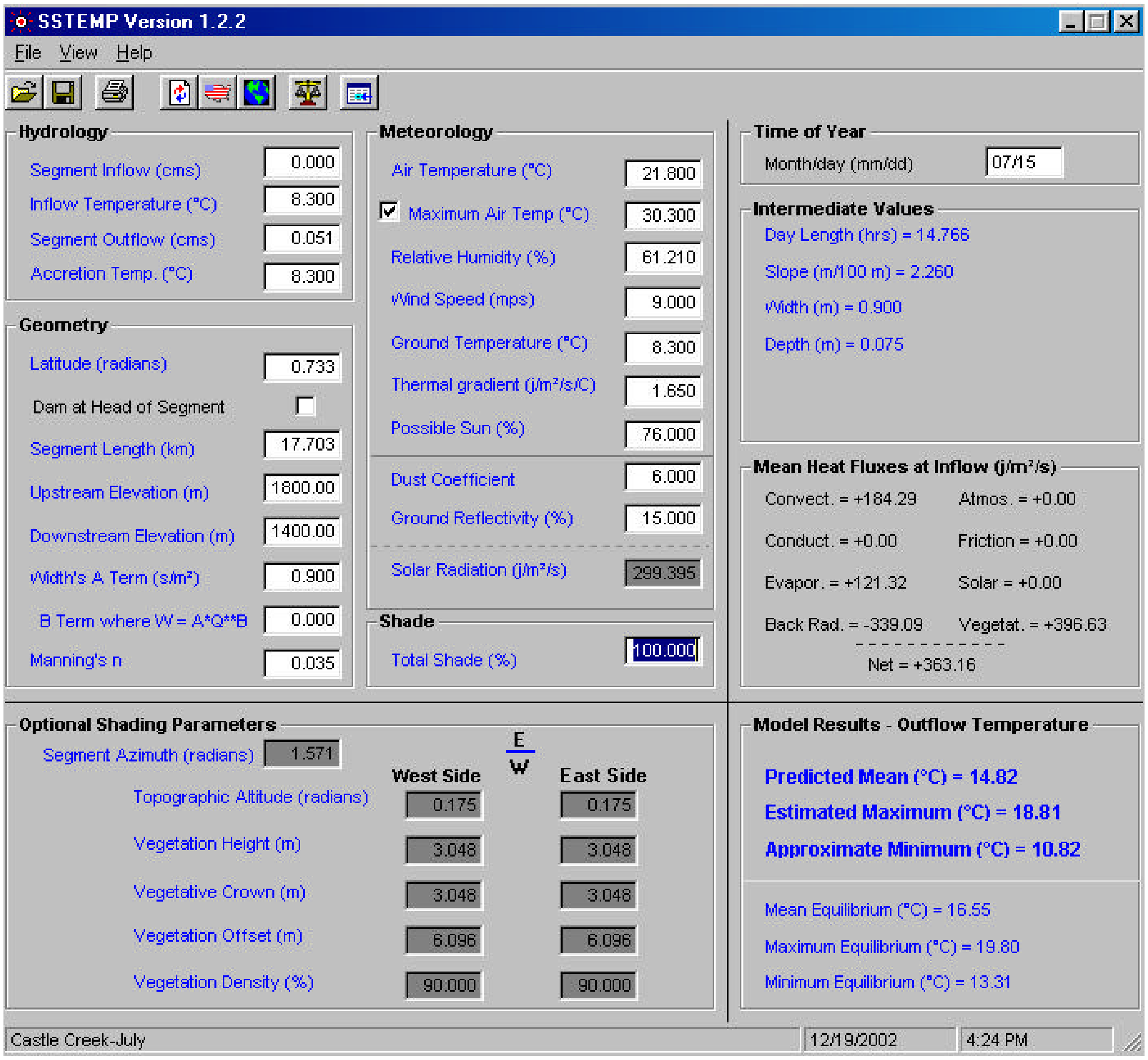
File View Help
Hydrology
Segment Inflow (cms) 0.000
Inflow Temperature (°C) 8.300
Segment Outflow (cms) 0.051
Accretion Temp. (°C) 8.300
Geometry
Latitude (radians) 0.733
Dam at Head of Segment
Segment Length (km) 17.703
Upstream Elevation (m) 1800.00
Downstream Elevation (m) 1400.00
Width's A Term (s/m²) 0.900
B Term where W = A*Q**B 0.000
Manning's n 0.035
Meteorology
Air Temperature (°C) 21.800
Maximum Air Temp (°C) 30.300
Relative Humidity (%) 61.210
Wind Speed (mps) 9.000
Ground Temperature (°C) 8.300
Thermal gradient (j/m²/s/C) 1.650
Possible Sun (%) 76.000
Dust Coefficient 6.000
Ground Reflectivity (%) 15.000
Solar Radiation (j/m²/s) 299.395
Shade
Total Shade (%) 75.000
Time of Year
Month/day (mm/dd) 07/15
Intermediate Values
Day Length (hrs) = 14.766
Slope (m/100 m) = 2.260
Width (m) = 0.900
Depth (m) = 0.075
Mean Heat Fluxes at Inflow (j/m²/s)
Convect. = +184.29
Atmos. = +86.71
Conduct. = +0.00
Friction = +0.00
Evapor. = +121.32
Solar = +74.85
Back Rad. = -339.09
Vegetat. = +297.47
Net = +425.56
Optional Shading Parameters
Segment Azimuth (radians) 1.571
E
W
West Side
East Side
Topographic Altitude (radians) 0.175 0.175
Vegetation Height (m) 3.048 3.048
Vegetative Crown (m) 3.048 3.048
Vegetation Offset (m) 6.096 6.096
Vegetation Density (%) 90.000 90.000
Model Results - Outflow Temperature
Predicted Mean (°C) = 15.83
Estimated Maximum (°C) = 20.69
Approximate Minimum (°C) = 10.98
Mean Equilibrium (°C) = 17.75
Maximum Equilibrium (°C) = 21.60
Minimum Equilibrium (°C) = 13.90
Castle Creek-July
12/19/2002
4:23 PM


SSTEMP Version 1.2.2
File View Help
Hydrology
Segment Inflow (cms) 0.000
Inflow Temperature (°C) 8.300
Segment Outflow (cms) 0.051
Accretion Temp. (°C) 8.300
Geometry
Latitude (radians) 0.733
Dam at Head of Segment
Segment Length (km) 17.703
Upstream Elevation (m) 1800.00
Downstream Elevation (m) 1400.00
Width's A Term (s/m²) 0.900
B Term where W = A*Q**B 0.000
Manning's n 0.035
Meteorology
Air Temperature (°C) 21.800
Maximum Air Temp (°C) 30.300
Relative Humidity (%) 61.210
Wind Speed (mps) 9.000
Ground Temperature (°C) 8.300
Thermal gradient (j/m²/s/C) 1.650
Possible Sun (%) 76.000
Dust Coefficient 6.000
Ground Reflectivity (%) 15.000
Solar Radiation (j/m²/s) 299.395
Shade
Total Shade (%) 90.000
Time of Year
Month/day (mm/dd) 07/15
Intermediate Values
Day Length (hrs) = 14.766
Slope (m/100 m) = 2.260
Width (m) = 0.900
Depth (m) = 0.075
Mean Heat Fluxes at Inflow (j/m²/s)
Convect. = +184.29 Atmos. = +34.69
Conduct. = +0.00 Friction = +0.00
Evapor. = +121.32 Solar = +29.94
Back Rad. = -339.09 Vegetat. = +356.97
Net = +388.12
Optional Shading Parameters
Segment Azimuth (radians) 1.571
E
W
West Side East Side
Topographic Altitude (radians) 0.175 0.175
Vegetation Height (m) 3.048 3.048
Vegetative Crown (m) 3.048 3.048
Vegetation Offset (m) 6.096 6.096
Vegetation Density (%) 90.000 90.000
Model Results - Outflow Temperature
Predicted Mean (°C) = 15.23
Estimated Maximum (°C) = 19.58
Approximate Minimum (°C) = 10.88
Mean Equilibrium (°C) = 17.04
Maximum Equilibrium (°C) = 20.53
Minimum Equilibrium (°C) = 13.54
Castle Creek-July 12/19/2002 4:23 PM


SSTEMP Version 1.2.2
File View Help
Hydrology
Segment Inflow (cms) 0.000
Inflow Temperature (°C) 8.300
Segment Outflow (cms) 0.051
Accretion Temp. (°C) 8.300
Geometry
Latitude (radians) 0.733
Dam at Head of Segment
Segment Length (km) 17.703
Upstream Elevation (m) 1800.00
Downstream Elevation (m) 1400.00
Width's A Term (s/m²) 0.900
B Term where W = A*Q**B 0.000
Manning's n 0.035
Meteorology
Air Temperature (°C) 21.800
Maximum Air Temp (°C) 30.300
Relative Humidity (%) 61.210
Wind Speed (mps) 9.000
Ground Temperature (°C) 8.300
Thermal gradient (j/m²/s/C) 1.650
Possible Sun (%) 76.000
Dust Coefficient 6.000
Ground Reflectivity (%) 15.000
Solar Radiation (j/m²/s) 299.395
Shade
Total Shade (%) 100.000
Time of Year
Month/day (mm/dd) 07/15
Intermediate Values
Day Length (hrs) = 14.766
Slope (m/100 m) = 2.260
Width (m) = 0.900
Depth (m) = 0.075
Mean Heat Fluxes at Inflow (j/m²/s)
Convect. = +184.29 Atmos. = +0.00
Conduct. = +0.00 Friction = +0.00
Evapor. = +121.32 Solar = +0.00
Back Rad. = -339.09 Vegetat. = +396.63
Net = +363.16
Optional Shading Parameters
Segment Azimuth (radians) 1.571
E
W
West Side East Side
Topographic Altitude (radians) 0.175 0.175
Vegetation Height (m) 3.048 3.048
Vegetative Crown (m) 3.048 3.048
Vegetation Offset (m) 6.096 6.096
Vegetation Density (%) 90.000 90.000
Model Results - Outflow Temperature
Predicted Mean (°C) = 14.82
Estimated Maximum (°C) = 18.81
Approximate Minimum (°C) = 10.82
Mean Equilibrium (°C) = 16.55
Maximum Equilibrium (°C) = 19.80
Minimum Equilibrium (°C) = 13.31
Castle Creek-July 12/19/2002 4:24 PM

SSTEMP (1.2.2) Sensitivity Analysis

Sensitivity for mean temperature values (10% variation) SSTEMP (1.2.2)

Original mean temperature = 14.82°C

Variable	Temperature change (°C) if variable is: Decreased	Increased	Relative Sensitivity
Segment Inflow (cms)	+0.00	+0.00	
Inflow Temperature (°C)	0.00	+0.00	
Segment Outflow (cms)	+0.13	-0.14	**
Accretion Temp. (°C)	-0.17	+0.17	***
Width's A Term (s/m²)	-0.13	+0.15	***
B Term where W = A*Q**B	+0.00	+0.00	
Manning's n	+0.00	+0.00	
Air Temperature (°C)	-1.64	+1.58	********************************
Relative Humidity (%)	-0.68	+0.69	**************
Wind Speed (mps)	-0.08	+0.09	**
Ground Temperature (°C)	-0.02	+0.02	
Thermal gradient (j/m²/s/C)	+0.02	-0.02	
Possible Sun (%)	+0.00	+0.00	
Dust Coefficient	+0.00	+0.00	
Ground Reflectivity (%)	+0.00	+0.00	
Total Shade (%)	+0.00	-0.41	*******
Maximum Air Temp (°C)	+0.00	+0.00	

Print View Maxes Close

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SSTEMP (1.2.2) Sensitivity Analysis

Sensitivity for maximum temperature values (10% varaition) SSTEMP (1.2.2)
Original maximum temperature = 18.81°C

Variable	Temperature change (°C) if variable is: Decreased	Increased	Relative Sensitivity
Segment Inflow (cms)	+0.00	+0.00	
Inflow Temperature (°C)	0.00	+0.00	
Segment Outflow (cms)	+0.11	-0.11	***
Accretion Temp. (°C)	-0.10	+0.10	**
Width's A Term (s/m²)	-0.11	+0.13	***
B Term where W = A*Q**B	+0.00	+0.00	
Manning's n	+0.04	-0.04	*
Air Temperature (°C)	-0.68	+0.64	***************
Relative Humidity (%)	-0.67	+0.69	***************
Wind Speed (mps)	-0.05	+0.06	*
Ground Temperature (°C)	-0.02	+0.02	
Thermal gradient (j/m²/s/C)	+0.03	-0.03	*
Possible Sun (%)	+0.00	+0.00	
Dust Coefficient	+0.00	+0.00	
Ground Reflectivity (%)	+0.00	+0.00	
Total Shade (%)	+0.00	-0.76	*****************
Maximum Air Temp (°C)	-1.27	+1.35	******************************

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Table D3.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Mid-Pole-Cowboy Creeks to Deep Creek F	13°C Max 9°C Avg.	June 1 through June 30	8.2	+122.43	34.4	34.4	0.0	32.1	Minimum Mean Maximum	10.7 14.4 18.1
				+126.77	34.4	34.4	0.0	11.8	Minimum Mean Maximum	9.8 13.5 17.3
				+88.84	50.0	34.4	15.4	11.8	Minimum Mean Maximum	9.8 13.0 16.1
				+22.64	75.0	34.4	35.6	11.8	Minimum Mean Maximum	10.0 12.1 14.1
				-15.89	90.0	34.4	55.6	11.8	Minimum Mean Maximum	10.0 11.5 12.9
				-41.57	100.0	34.4	65.6	11.8	Minimum Mean Maximum	10.1 11.1 12.1
Bull Gulch B, G and F	13°C Max 9°C Avg.	June 1 through June 30	14.5	+402.09	7.7	0.9	6.8	24.4	Minimum Mean Maximum	11.7 16.2 20.1
				+416.55	2.3	0.4	1.9	10.9	Minimum Mean Maximum	10.9 15.9 20.9
				+293.98	50.0	0.4	49.6	10.9	Minimum Mean Maximum	10.6 13.8 17.1
				+229.73	75.0	0.4	74.6	10.9	Minimum Mean Maximum	10.5 12.7 14.9
				+191.18	90.0	0.4	89.6	10.9	Minimum Mean Maximum	10.5 12.0 13.5
				+165.48	100	0.4	99.6	10.9	Minimum Mean Maximum	10.4 11.5 12.6

Table D4.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m²/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Red Canyon Creek A, B and F	13°C Max 9°C Avg.	June 1 through June 30	13.2	+360.52	23.7	20.8	2.9	25.4	Minimum Mean Maximum	8.6 13.1 17.6
				+358.32	24.6	20.8	3.8	11.8	Minimum Mean Maximum	7.8 12.1 16.4
				+292.97	50.0	20.8	29.2	11.8	Minimum Mean Maximum	8.2 11.4 14.7
				+228.64	75.0	20.8	54.2	11.8	Minimum Mean Maximum	8.6 10.7 12.8
				+190.05	90.0	20.8	69.2	11.8	Minimum Mean Maximum	8.9 10.3 11.7
				+164.32	100.0	20.8	79.2	11.8	Minimum Mean Maximum	9.1 10.0 11.0
Lower Deep Creek F	13°C Max 9°C Avg.	June 1 through June 30	8.4	+129.12	34.4	34.4	0.0	104.0	Minimum Mean Maximum	13.0 15.7 18.4
				+89.3	50.0	34.4	15.6	104.0	Minimum Mean Maximum	12.7 14.9 17.2
				+25.31	75.0	34.4	40.6	104.0	Minimum Mean Maximum	12.1 13.7 15.2
				-13.11	90.0	34.4	55.6	104.0	Minimum Mean Maximum	11.8 12.9 14.0
				-38.72	100.0	34.4	65.6	104.0	Minimum Mean Maximum	11.6 12.4 13.1

Table D5.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Upper Dickshooter Creek G, F	13°C Max 9°C Avg.	June 1 through June 30	11.7	+277.12	2.3	0.4	1.9	30.3	Minimum Mean Maximum	10.5 14.8 19.1
				+279.06	2.3	0.4	1.9	13.3	Minimum Mean Maximum	10.5 14.8 19.2
				+156.69	50.0	0.4	49.6	13.3	Minimum Mean Maximum	9.2 12.2 15.1
				+92.54	75.0	0.4	74.6	13.3	Minimum Mean Maximum	8.6 10.6 12.7
				+54.05	90.0	0.4	89.6	13.3	Minimum Mean Maximum	8.2 9.7 11.1
				+28.39	100.0	0.4	99.6	13.3	Minimum Mean Maximum	8.0 9.0 10.0
Lower Dickshooter Creek F	13°C Max 9°C Avg.	June 1 through June 30	13.0	+53.93	33.6	33.6	0.0	22.8	Minimum Mean Maximum	7.1 12.4 17.6
				+54.56	33.6	33.6	0.0	11.9	Minimum Mean Maximum	6.7 11.7 16.7
				+12.46	50.0	33.6	16.4	11.9	Minimum Mean Maximum	7.0 11.0 14.9
				-51.76	75.0	33.6	38.4	11.9	Minimum Mean Maximum	7.5 9.8 12.2
				-90.28	90.0	33.6	53.4	11.9	Minimum Mean Maximum	7.7 10.6 9.2
				-115.97	100.0	33.6	66.4	11.9	Minimum Mean Maximum	7.9 8.7 9.6

Table D6.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	^{o}C
Beaver Creek A, B & G	13^{o}C Max 9^{o}C Avg.	June 1 through June 30	8.7	+273.40	2.6	0.9	1.7	24.2	Minimum Mean Maximum	7.8 13.1 18.3
				+273.36	2.6	0.9	1.7	11.4	Minimum Mean Maximum	7.1 12.4 17.8
				+151.68	50.0	0.9	49.1	11.4	Minimum Mean Maximum	7.3 10.6 13.9
				+87.51	75.0	0.9	74.1	11.4	Minimum Mean Maximum	7.5 9.6 11.8
				+49.00	90.0	0.9	89.1	11.4	Minimum Mean Maximum	7.6 9.1 10.5
				+23.33	100.0	0.9	99.1	11.4	Minimum Mean Maximum	7.7 8.7 9.7

Table D7.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Mid-Pole-Cowboy Creeks to Deep Creek F	13°C Max 9°C Avg.	June 1 through June 30	8.2	+141.67	34.4	34.4	0.0	27.6	Minimum Mean Maximum	8.7 12.3 16.0
				+144.85	34.4	34.4	0.0	11.6	Minimum Mean Maximum	8.4 11.9 15.5
				+104.96	50.0	34.4	15.6	11.6	Minimum Mean Maximum	8.3 11.2 14.2
				+40.87	75.0	34.4	40.6	11.6	Minimum Mean Maximum	8.2 10.1 12.1
				+2.42	90.0	34.4	55.6	11.6	Minimum Mean Maximum	8.1 9.4 10.8
				-23.22	100.0	34.4	65.6	11.6	Minimum Mean Maximum	8.1 9.0 9.9
Bull Gulch B, G and F	13°C Max 9°C Avg.	June 1 through June 30	14.5	+191.66	34.4	34.4	0.0	24.3	Minimum Mean Maximum	8.5 12.3 16.2
				+191.66	34.4	34.4	0.0	14.0	Minimum Mean Maximum	8.2 12.1 16.0
				+151.71	50.0	34.4	15.6	14.0	Minimum Mean Maximum	8.1 11.3 14.6
				+87.54	75.0	34.4	40.6	14.0	Minimum Mean Maximum	7.9 10.1 12.3
				+49.04	90.0	34.4	55.6	14.0	Minimum Mean Maximum	7.8 9.3 10.8
				+23.37	100.0	34.4	65.6	14.0	Minimum Mean Maximum	7.8 8.8 9.8

Table D8.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Mid-Pole Creek to Deep Creek F	13°C Max 9°C Avg.	June 1 through June 30	10.3	+195.36	14.5	11.2	3.3	28.1	Minimum Mean Maximum	10.1 14.1 18.1
				+195.84	16.1	11.2	4.8	12.7	Minimum Mean Maximum	9.8 13.8 17.8
				+108.82	50.0	11.2	38.8	12.7	Minimum Mean Maximum	9.2 12.0 14.9
				+44.73	75.0	11.2	63.8	11.7	Minimum Mean Maximum	8.7 10.7 12.6
				+6.28	90.0	11.2	78.8	11.7	Minimum Mean Maximum	8.5 9.8 11.2
				-19.36	100.0	11.2	88.8	11.7	Minimum Mean Maximum	8.4 9.3 10.2
Castle Creek A, B, C and G	13°C Max 9°C Avg.	June 1 through June 30	11.0	+274.04	2.4	1.4	1.0	25.4	Minimum Mean Maximum	8.0 13.1 18.2
				+272.50	2.6	1.4	1.2	12.9	Minimum Mean Maximum	7.4 12.5 17.6
				+151.83	50.0	1.4	48.6	12.9	Minimum Mean Maximum	7.5 10.7 13.8
				+87.68	75.0	1.4	73.6	12.9	Minimum Mean Maximum	7.6 9.7 11.7
				+49.19	90.0	1.4	88.6	12.9	Minimum Mean Maximum	7.7 9.1 10.5
				+23.53	100.0	1.4	98.6	12.9	Minimum Mean Maximum	7.7 8.7 9.6

Table D9.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Hurry Back A, B and C	13°C Max 9°C Avg.	June 1 through June 30	11.2	+246.21	12.6	7.1	5.5	28.4	Minimum Mean Maximum	7.5 12.2 16.9
				+241.25	14.5	7.1	7.4	12.2	Minimum Mean Maximum	7.0 11.4 15.8
				+150.16	50.0	7.1	42.9	12.2	Minimum Mean Maximum	7.3 10.2 13.2
				+85.90	75.0	7.1	67.9	12.2	Minimum Mean Maximum	7.5 9.4 11.3
				+47.35	90.0	7.1	82.1	12.2	Minimum Mean Maximum	7.6 8.9 10.2
				+21.64	100.0	7.1	92.1	12.2	Minimum Mean Maximum	7.7 8.6 9.5
Nip and Tuck Creek A, B and C	13°C Max 9°C Avg.	June 1 through June 30	6.8	+242.46	14.1	7.1	7.0	22.9	Minimum Mean Maximum	6.5 11.5 16.5
				+239.20	15.4	7.1	8.3	11.8	Minimum Mean Maximum	6.0 10.8 15.7
				+150.23	50.0	7.1	42.9	11.8	Minimum Mean Maximum	6.7 9.9 13.1
				+85.89	75.0	7.1	67.9	11.8	Minimum Mean Maximum	7.2 9.2 11.3
				+47.42	90.0	7.1	82.9	11.8	Minimum Mean Maximum	7.4 8.8 10.2
				+21.72	100.0	7.1	92.9	11.8	Minimum Mean Maximum	7.6 8.5 9.5

Table D10.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Deep Creek to Current Cr. F	13°C Max 9°C Avg.	June 1 through June 30	5	+147.99	34.4	34.4	0.0	22.9	Minimum Mean Maximum	8.2 11.0 13.7
				+149.59	34.4	34.4	0.0	12.9	Minimum Mean Maximum	8.2 10.6 13.1
				+109.77	50.0	34.4	15.6	12.9	Minimum Mean Maximum	8.3 10.3 12.3
				+45.69	75.0	34.4	40.6	12.9	Minimum Mean Maximum	8.6 9.9 11.1
				+7.24	90.0	34.4	55.6	`12.9	Minimum Mean Maximum	8.7 9.6 10.4
				-18.40	100.0	34.4	65.6	12.9	Minimum Mean Maximum	8.8 9.4 9.9
Current Creek A, B and C	13°C Max 9°C Avg.	June 1 through June 30	13.5	+191.13	34.4	34.4	0.0	25.8	Minimum Mean Maximum	7.7 11.3 14.9
				+191.13	34.4	34.4	0.0	11.8	Minimum Mean Maximum	7.4 10.8 14.2
				+151.13	50.0	34.4	15.6	11.8	Minimum Mean Maximum	7.5 10.3 13.1
				+86.88	75.0	34.4	40.6	11.8	Minimum Mean Maximum	7.7 9.4 11.2
				+48.32	90.0	34.4	55.6	11.8	Minimum Mean Maximum	7.7 8.9 10.1
				+22.62	100.0	34.4	65.6	11.8	Minimum Mean Maximum	7.8 8.6 9.4

Table D11.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Red Canyon Creek A, B and F	13°C Max 9°C Avg.	June 1 through June 30	13.2	+191.21	34.4	34.4	0.0	24.2	Minimum Mean Maximum	7.7 11.5 15.3
				+191.21	34.4	34.4	0.0	14.9	Minimum Mean Maximum	7.4 11.2 15.0
				+151.22	50.0	34.4	15.6	14.9	Minimum Mean Maximum	7.5 10.6 13.7
				+86.89	75.0	34.4	40.6	14.9	Minimum Mean Maximum	7.6 9.6 11.7
				+48.44	90.0	34.4	55.6	14.9	Minimum Mean Maximum	7.7 9.0 10.4
				+22.74	100.0	34.4	65.6	14.9	Minimum Mean Maximum	7.7 8.7 9.6
Lower Deep Creek F	13°C Max 9°C Avg.	June 1 through June 30	8.4	+148.57	34.4	34.4	0.0	100	Minimum Mean Maximum	8.8 11.9 15.0
				+108.76	50.0	34.4	15.6	100	Minimum Mean Maximum	8.7 11.2 13.8
				+44.80	75.0	34.4	40.6	100	Minimum Mean Maximum	8.5 10.1 11.8
				+6.42	90.0	34.4	55.6	100	Minimum Mean Maximum	8.3 9.5 10.6
				-19.16	100.0	34.4	65.6	100	Minimum Mean Maximum	8.2 9.0 9.8

Table D12.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Middle Deep Creek Nickel Cr. To Pole Creek F	13°C Max 9°C Avg.	June 1 through June 30	5	+159.46	34.4	34.4	0.0	27.0	Minimum Mean Maximum	7.8 10.6 13.4
				+162.95	34.4	34.4	0.0	12.8	Minimum Mean Maximum	7.7 10.2 12.6
				+123.10	50.0	34.4	15.6	12.8	Minimum Mean Maximum	8.0 9.9 11.9
				+59.09	75.0	34.4	55.6	12.8	Minimum Mean Maximum	8.3 9.6 10.8
				+20.69	90.0	34.4	65.6	12.8	Minimum Mean Maximum	8.5 9.3 10.1
				-4.92	100.0	34.4	75.6	12.8	Minimum Mean Maximum	8.6 9.2 9.7
Nickel Creek A, B, C and F	13°C Max 9°C Avg.	June 1 through June 30	9.7	+190.91	34.4	34.4	0.0	29.1	Minimum Mean Maximum	7.3 11.3 15.3
				+190.91	34.4	34.4	0.0	11.5	Minimum Mean Maximum	6.8 10.6 14.5
				+150.89	50.0	34.4	15.6	11.5	Minimum Mean Maximum	7.0 10.1 13.3
				+86.60	75.0	34.4	40.6	11.5	Minimum Mean Maximum	7.3 9.4 11.4
				+48.02	90.0	34.4	55.6	11.5	Minimum Mean Maximum	7.5 8.9 10.3
				+22.31	100.0	34.4	65.6	11.5	Minimum Mean Maximum	7.7 8.6 9.5

Table D13.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	^{o}C
Middle Deep, Current Creek to Nickel Creek F	13^{o}C Max 9^{o}C Avg.	June 1 through June 30	15.8	+162.92	34.4	34.4	0.0	24.9	Minimum Mean Maximum	9.4 12.1 14.8
				+166.17	34.4	34.4	0.0	13.0	Minimum Mean Maximum	9.2 11.6 14.0
				+126.39	50.0	34.4	15.6	13.0	Minimum Mean Maximum	9.0 11.0 13.0
				+62.36	75.0	34.4	40.6	13.0	Minimum Mean Maximum	8.8 10.1 11.4
				+23.94	90.0	34.4	55.6	13.0	Minimum Mean Maximum	8.6 9.5 10.4
				-1.67	100.0	34.4	65.6	13.0	Minimum Mean Maximum	8.5 9.1 9.7
Upper Pole Creek A, B, C and F	13^{o}C Max 9^{o}C Avg.	June 1 through June 30	6.8	+241.67	14.7	1.7	13.0	22.4	Minimum Mean Maximum	8.5 13.1 17.6
				+238.59	15.9	1.7	14.2	11.5	Minimum Mean Maximum	8.1 12.6 17.2
				+150.83	50.0	1.7	48.3	11.5	Minimum Mean Maximum	7.9 11.1 14.2
				+86.53	75.0	1.7	73.3	11.5	Minimum Mean Maximum	7.8 9.9 12.0
				+47.95	90.0	1.7	88.3	11.5	Minimum Mean Maximum	7.8 9.2 10.6
				+22.24	100.0	1.7	98.3	11.5	Minimum Mean Maximum	7.8 8.7 9.7

Table D14.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Nip and Tuck A, B and G	22°C Max 19°C Avg.	Ju1y 1 through July 31	6.8	+568.79	16.1	11.5	4.6	25.4	Minimum Mean Maximum	10.4 17.6 24.7
				+566.01	17.2	11.5	5.7	13.3	Minimum Mean Maximum	9.0 16.6 24.1
				+483.94	50.0	11.5	38.5	13.3	Minimum Mean Maximum	9.0 15.4 21.9
				+421.43	75.0	11.5	63.5	13.3	Minimum Mean Maximum	9.1 14.6 20.1
				+383.92	90.0	11.5	73.5	13.3	Minimum Mean Maximum	9.2 14.0 18.9
				+358.92	100.0	11.5	88.5	13.3	Minimum Mean Maximum	9.2 13.7 18.1
Current-Stoneman Creeks A, B, C and F	22°C Max 19°C Avg.	July 1 through July 31	8.9	+523.40	34.9	34.9	0.0	25.3	Minimum Mean Maximum	12.0 17.8 23.5
				+523.40	34.9	34.9	0.0	14.2	Minimum Mean Maximum	11.2 17.2 23.1
				+485.58	50.0	34.9	15.1	14.2	Minimum Mean Maximum	11.1 16.7 22.1
				+423.07	75.0	34.9	40.1	14.2	Minimum Mean Maximum	10.9 15.6 20.3
				+385.56	90.0	34.9	55.1	14.2	Minimum Mean Maximum	10.8 15.0 19.2
				+360.55	100.0	34.9	65.1	14.2	Minimum Mean Maximum	10.8 14.6 18.5

Table D15.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	^oC
Nickel Creek A, B, G and F	22^oC Max 19^oC Avg.	Ju1y 1 through July 31	9.7	+520.37	34.9	34.9	0.0	23.3	Minimum Mean Maximum	11.0 17.3 23.6
				+520.37	34.9	34.9	0.0	13.7	Minimum Mean Maximum	10.2 16.7 23.2
				+482.53	50.0	34.9	15.1	13.7	Minimum Mean Maximum	10.1 16.1 22.2
				+419.98	75.0	34.9	40.1	13.7	Minimum Mean Maximum	10.0 15.2 20.4
				+382.45	90.0	34.9	55.1	13.7	Minimum Mean Maximum	10.0 14.6 19.3
				+357.43	100.0	34.9	65.1	13.7	Minimum Mean Maximum	10.0 14.2 18.5
Upper Pole Creek B, C and G	22^oC Max 19^oC Avg.	July 1 through July 31	6.8	+566.77	16.3	1.8	14.5	26.0	Minimum Mean Maximum	13.2 19.2 25.2
				+564.48	17.2	1.8	15.4	11.9	Minimum Mean Maximum	12.3 18.6 24.8
				+482.33	50.0	1.8	48.2	11.9	Minimum Mean Maximum	11.8 17.2 22.7
				+419.78	75.0	1.8	73.2	11.9	Minimum Mean Maximum	11.5 16.2 20.9
				+382.25	90.0	1.8	88.2	11.9	Minimum Mean Maximum	11.4 15.6 19.8
				+357.22	100.0	1.8	98.2	11.9	Minimum Mean Maximum	11.3 15.1 19.0

Table D16.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m²/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Camas Creek B, C and G	22°C Max 19°C Avg.	Ju1y 1 through July 31	8.9	+588.57	8.5	0.9	7.6	26.0	Minimum Mean Maximum	13.4 19.6 25.8
				+587.65	8.9	0.9	8.0	15.1	Minimum Mean Maximum	12.7 19.2 25.7
				+484.87	50.0	0.9	49.9	15.1	Minimum Mean Maximum	12.0 17.6 23.1
				+422.33	75.0	0.9	74.1	15.1	Minimum Mean Maximum	11.7 16.5 21.4
				+384.80	90.0	0.9	89.1	15.1	Minimum Mean Maximum	11.5 15.9 20.2
				+359.76	100.0	0.9	99.1	15.1	Minimum Mean Maximum	11.4 15.4 19.5
Camel Creek A, B, C and G	22°C Max 19°C Avg.	July 1 through July 31		+567.07	16.6	7.3	9.3	24.3	Minimum Mean Maximum	13.9 19.5 25.2
				+565.91	17.1	7.3	9.8	12.3	Minimum Mean Maximum	13.3 19.2 25.1
				+483.66	50.0	7.3	42.7	12.3	Minimum Mean Maximum	12.7 17.8 22.9
				+421.17	75.0	7.3	64.7	12.3	Minimum Mean Maximum	12.3 16.7 21.2
				+383.67	90.0	7.3	82.7	12.3	Minimum Mean Maximum	12.1 16.1 20.1
				+358.67	100.0	7.3	92.7	12.3	Minimum Mean Maximum	11.9 15.6 19.3

Table D17.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Castle Creek A, B, C and G	22°C Max 19°C Avg.	Ju1y 1 through July 31	11.0	+607.76	2.0	0.4	1.6	24.5	Minimum Mean Maximum	12.8 19.4 25.9
				+607.57	2.1	0.4	1.7	12.0	Minimum Mean Maximum	11.7 18.6 25.5
				+487.97	50.0	0.4	49.6	12.0	Minimum Mean Maximum	11.2 16.8 22.5
				+425.56	75.0	0.4	74.6	12.0	Minimum Mean Maximum	11.0 15.8 20.7
				+388.12	90.0	0.4	89.6	12.0	Minimum Mean Maximum	10.9 15.2 19.6
				+363.16	100.0	0.4	99.6	12.0	Minimum Mean Maximum	10.8 14.8 18.8
Beaver Creek B, C and G	22°C Max 19°C Avg.	July 1 through July 31	8.7	+607.14	2.1	0.4	1.7	26.1	Minimum Mean Maximum	12.6 19.3 26.0
				+607.10	2.1	0.4	1.7	11.1	Minimum Mean Maximum	11.1 18.4 25.6
				+487.45	50.0	0.4	49.6	11.1	Minimum Mean Maximum	10.7 16.6 22.5
				+425.02	75.0	0.4	74.6	11.1	Minimum Mean Maximum	10.5 15.6 20.8
				+387.56	90.0	0.4	89.6	11.1	Minimum Mean Maximum	10.5 15.0 19.6
				+362.59	100.0	0.4	99.6	11.1	Minimum Mean Maximum	10.4 11.6 18.8

Table D18.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m²/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Bull Gulch B and F	22°C Max 19°C Avg.	Ju1y 1 through July 31	14.5	+525.24	34.9	34.9	0.0	23.5	Minimum Mean Maximum	13.1 18.6 24.1
				+525.24	34.9	34.9	0.0	11.1	Minimum Mean Maximum	12.3 18.1 24.0
				+487.55	50.0	34.9	15.1	11.1	Minimum Mean Maximum	12.1 17.5 23.0
				+425.13	75.0	34.9	40.1	11.1	Minimum Mean Maximum	11.7 16.5 21.2
				+387.67	90.0	34.9	55.1	11.1	Minimum Mean Maximum	11.5 15.8 20.1
				+362.70	100.0	34.9	65.1	11.1	Minimum Mean Maximum	11.4 15.4 19.4
Upper Dickshooter Creek B and C	22°C Max 19°C Avg.	July 1 through July 31		+591.40	8.6	3.5	5.0	22.2	Minimum Mean Maximum	14.1 19.9 25.8
				+591.20	8.6	3.5	5.1	13.9	Minimum Mean Maximum	13.8 19.7 25.7
				+487.97	50.0	3.5	46.5	13.9	Minimum Mean Maximum	12.9 18.0 23.1
				+425.56	75.0	3.5	71.5	13.9	Minimum Mean Maximum	12.5 16.9 21.4
				+388.12	90.0	3.5	86.5	13.9	Minimum Mean Maximum	12.3 16.3 20.3
				+363.16	100.0	3.5	96.5	13.9	Minimum Mean Maximum	12.1 15.8 19.5

Table D19.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Bull Gulch B and F	22°C Max 19°C Avg.	Ju1y 1 through July 31	14.5	+525.24	34.9	34.9	0.0	23.5	Minimum Mean Maximum	13.1 18.6 24.1
				+525.24	34.9	34.9	0.0	11.1	Minimum Mean Maximum	12.3 18.1 24.0
				+487.55	50.0	34.9	15.1	11.1	Minimum Mean Maximum	12.1 17.5 23.0
				+425.13	75.0	34.9	40.1	11.1	Minimum Mean Maximum	11.7 16.5 21.2
				+387.67	90.0	34.9	55.1	11.1	Minimum Mean Maximum	11.5 15.8 20.1
				+362.70	100.0	34.9	65.1	11.1	Minimum Mean Maximum	11.4 15.4 19.4
Upper Dickshooter Creek B and C	22°C Max 19°C Avg.	July 1 through July 31		+591.40	8.6	3.5	5.0	22.2	Minimum Mean Maximum	14.1 19.9 25.8
				+591.20	8.6	3.5	5.1	13.9	Minimum Mean Maximum	13.8 19.7 25.7
				+487.97	50.0	3.5	46.5	13.9	Minimum Mean Maximum	12.9 18.0 23.1
				+425.56	75.0	3.5	71.5	13.9	Minimum Mean Maximum	12.5 16.9 21.4
				+388.12	90.0	3.5	86.5	13.9	Minimum Mean Maximum	12.3 16.3 20.3
				+363.16	100.0	3.5	96.5	13.9	Minimum Mean Maximum	12.1 15.8 19.5

Table D20.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m²/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Deep Creek, Hurry Back to Current Creek G and F	22°C Max 19°C Avg.	Ju1y 1 through July 31	5	+11.36	34.9	34.9	0.0	24.0	Minimum Mean Maximum	14.7 19.3 23.9
Model Run does not Show Water Temperature Reductions Upstream				+24.83	34.9	34.9	0.0	12.3	Minimum Mean Maximum	14.6 19.1 23.6
				+15.93	50.0	34.9	15.1	12.3	Minimum Mean Maximum	14.5 22.7 18.6
				+0.46	75.0	34.9	40.1	12.3	Minimum Mean Maximum	14.2 17.8 21.2
				-9.26	90.0	34.9	55.1	12.3	Minimum Mean Maximum	14.2 17.2 20.3
				-15.92	100	34.9	65.1	12.3	Minimum Mean Maximum	14.1 16.9 19.7
Deep Creek, Hurry Back to Current Creek G and F	22°C Max 19°C Avg.	July 1 through July 31	5						Minimum Mean Maximum	15.2 19.8 24.2
Model Run Shows Water Temperature Reduction Achieved Upstream									Minimum Mean Maximum	15.8 19.9 24.1
									Minimum Mean Maximum	15.6 19.4 23.3
									Minimum Mean Maximum	15.4 18.6 21.8
									Minimum Mean Maximum	15.3 18.1 21.0
									Minimum Mean Maximum	15.2 17.8 20.4

Table D21.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m²/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Red Canyon Creek A, B and F	22°C Max 19°C Avg.	Ju1y 1 through July 31	13.2	+523.71	34.9	34.9	0.0	24.1	Minimum Mean Maximum	12.0 17.9 23.8
				+523.71	34.9	34.9	0.0	12.6	Minimum Mean Maximum	11.1 17.2 23.4
				+485.90	50.0	34.9	15.1	12.6	Minimum Mean Maximum	11.0 16.6 22.3
				+423.40	75.0	34.9	40.1	12.6	Minimum Mean Maximum	10.8 15.7 20.6
				+385.90	90.0	34.9	55.1	12.6	Minimum Mean Maximum	10.7 15.1 19.4
				+360.90	100.0	34.9	65.1	12.6	Minimum Mean Maximum	10.7 11.7 18.7

Table D22.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	^{o}C
Camel Creek A, B and G	13^{o}C Max 9^{o}C Avg.	June 1 through June 30	4.0	+237.91	16.3	11.2	5.1	26.6	Minimum Mean Maximum	7.9 12.7 17.5
				+233.74	17.9	11.2	6.7	11.9	Minimum Mean Maximum	8.0 12.8 17.5
				+151.22	50.0	11.2	38.8	11.9	Minimum Mean Maximum	7.9 11.2 14.6
				+86.89	75.0	11.2	63.8	11.9	Minimum Mean Maximum	7.8 10.0 12.3
				+48.44	90.0	11.2	78.8	11.9	Minimum Mean Maximum	7.7 9.3 10.8
				+22.74	100.0	11.2	88.8	11.9	Minimum Mean Maximum	7.7 8.8 9.8
Camas Creek A, B and G	13^{o}C Max 9^{o}C Avg.	June 1 through June 30	8.9	+260.69	7.3	0.9	6.4	23.6	Minimum Mean Maximum	9.2 13.8 18.5
				+259.21	7.9	0.9	7.0	13.2	Minimum Mean Maximum	8.9 13.6 18.2
				+150.92	50.0	0.9	49.1	13.2	Minimum Mean Maximum	8.3 11.5 14.6
				+86.64	75.0	0.9	74.1	13.2	Minimum Mean Maximum	8.0 10.2 12.2
				+48.07	90.0	0.9	89.1	13.2	Minimum Mean Maximum	7.9 9.3 10.8
				+22.35	100.0	0.9	99.1	13.2	Minimum Mean Maximum	7.8 8.8 9.8

Table D23.

Stream Name Rosgen Channel Type	Target Temperature	Model Run Dates	Segment Length (mi.)	Solar Radiation Components 24 hours (+/-) (joules/m^2/sec)	% Total Shade	% Topo Shade	% Veg Shade	Width/ Depth Ratio	Temperature (24 hours)	°C
Deep Creek, Current to Pole Creek F	13°C Max 9°C Avg.	June 1 through June 30	15.8	+145.86	34.4	34.4	0.0	27.6	Minimum Mean Maximum	9.5 12.3 15.1
				+149.64	34.4	34.4	0.0	11.6	Minimum Mean Maximum	9.3 11.7 14.2
				+109.78	50.0	34.4	15.6	11.6	Minimum Mean Maximum	9.1 11.1 13.2
				+45.75	75.0	34.4	40.6	11.6	Minimum Mean Maximum	8.9 10.2 11.5
				+7.34	90.0	34.4	55.6	11.6	Minimum Mean Maximum	8.7 9.6 10.5
				-18.27	100.0	34.4	66.6	11.6	Minimum Mean Maximum	8.6 9.2 9.8
Upper Pole Creek A, B, C and F	13°C Max 9°C Avg.	June 1 through June 30	6.8	+241.66	14.7	1.7	13.0	22.4	Minimum Mean Maximum	8.5 13.1 17.6
				+238.59	15.9	1.7	14.2	11.5	Minimum Mean Maximum	8.1 12.6 17.2
				+150.83	50.0	1.7	48.3	11.5	Minimum Mean Maximum	7.9 11.1 14.2
				+86.53	75.0	1.7	73.3	11.5	Minimum Mean Maximum	7.8 9.9 12.0
				+47.95	90.0	1.7	88.3	11.5	Minimum Mean Maximum	7.8 9.2 10.6
				+22.24	100.0	1.7	98.3	11.5	Minimum Mean Maximum	7.8 8.7 9.7

Table D24. Discharge-Load Calculations

Sediment Discharge

Castle Creek						
Mean annual Discharge	Load Capacity 80 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity 50 mg/l	Load Capacity ^@ 50 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity ^@ 50 mg/l
cfs	mg/l	lbs/day	mg/l	lbs/day	tons/year	tons/year
11.8	80	2.3E+03	50	1.44E+03	1.54E+05	9.61E+04

Deep Creek						
Mean annual Discharge	Load Capacity 80 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity 50 mg/l	Load Capacity ^@ 50 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity ^@ 50 mg/l
cfs	mg/l	lbs/day	mg/l	lbs/day	tons/year	tons/year
52.03	80	1.0E+04	50	6.36E+03	6.78E+05	4.24E+05

Blue Creek						
Mean annual Discharge	Load Capacity 80 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity 50 mg/l	Load Capacity ^@ 50 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity ^@ 50 mg/l
cfs	mg/l	lbs/day	mg/l	lbs/day	tons/year	tons/year
6.74	80	1.3E+03	50	8.24E+02	8.79E+04	5.49E+04

Juniper Creek						
Mean annual Discharge	Load Capacity 80 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity 50 mg/l	Load Capacity ^@ 50 mg/l	Load Capacity ^@ 80 mg/l	Load Capacity ^@ 50 mg/l
cfs	mg/l	lbs/day	mg/l	lbs/day	tons/year	tons/year
1.96	80	3.84E+02	50	2.40E+02	2.55E+04	1.60E+04

Table D25. Discharge-Load Calculations

Reverse load Analysis
Tons to
mg/l

Deep Creek												
	Low Yeild	Low Yeild	Low Yeild	Low Yeild	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	3420.00	9.4	8498.5	8.50E+09	1.00E-06	98362	52	1891.57	66.8			

Deep Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual	Concentration	Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	52	66.8	28.312	9.84E+04	1.00E-06	9.84E-02	86400	8.50E+03	0.0011	9.35E+00	365	3412

Deep Creek												
	High Yield	High Yield	High Yield	High Yield	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	56196.00	154.0	139643.2	1.40E+11	1.00E-06	1616241	52	31081.56	1097.7			

Deep Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual		Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	52	1097.7	28.312	1.62E+06	1.00E-06	1.62E+00	86400	1.40E+05	0.0011	1.54E+02	365	56061

Table D26. Discharge-Load Calculations

Reverse load Analysis
Tons to
mg/l

Castle Creek												
	Low Yeild	Low Yeild	Low Yeild	Low Yeild	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	156.00	0.4	387.6	3.88E+08	1.00E-06	4487	11.8	380.23	13.4			

Castle Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual	Concentration	Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	11.8	13.4	28.312	4.49E+03	1.00E-06	4.49E-03	86400	3.88E+02	0.0011	4.26E-01	365	156

Castle Creek												
	High Yield	High Yield	High Yield	High Yield	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	2580.00	7.1	6411.1	6.41E+09	1.00E-06	74203	11.8	6288.37	222.1			

Castle Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual		Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	11.8	222.1	28.312	7.42E+04	1.00E-06	7.42E-02	86400	6.41E+03	0.0011	7.05E+00	365	2574

Table D27. Discharge-Load Calculations

Reverse load Analysis
Tons to mg/l

Juniper Creek												
	Low Yeild	Low Yeild	Low Yeild	Low Yeild	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	492.00	1.3	1222.6	1.22E+09	1.00E-06	14150	2	7075.15	249.9			

Juniper Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual	Concentration	Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	2	249.9	28.312	1.41E+04	1.00E-06	1.41E-02	86400	1.22E+03	0.0011	1.34E+00	365	491

Juniper Creek												
	High Yield	High Yield	High Yield	High Yield	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	8100.00	22.2	20127.9	2.01E+10	1.00E-06	232962	2	116481.16	4113.8			

Juniper Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual		Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	2	4113.8	28.312	2.33E+05	1.00E-06	2.33E-01	86400	2.01E+04	0.0011	2.21E+01	365	8081

Table D28. Discharge-Load Calculations

Reverse load Analysis
Tons to mg/l

Blue Creek												
	Low Yeild	Low Yeild	Low Yeild	Low Yeild	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	326.00	0.9	810.1	8.10E+08	1.00E-06	9376	6.7	1399.41	49.4			

Blue Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual	Concentration	Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	6.7	49.4	28.312	9.38E+03	1.00E-06	9.38E-03	86400	8.10E+02	0.0011	8.91E-01	365	325

Blue Creek												
	High Yield	High Yield	High Yield	High Yield	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	5370.00	14.7	13344.1	1.33E+10	1.00E-06	154445	6.7	23051.55	814.1			

Blue Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual		Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	6.7	814.1	28.312	1.54E+05	1.00E-06	1.54E-01	86400	1.33E+04	0.0011	1.47E+01	365	5357

Table D29. Discharge-Load Calculations

Reverse load Analysis
Tons to mg/l

Nickel Creek												
	Low Yeild	Low Yeild	Low Yeild	Low Yeild	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	23.50	0.1	58.4	5.84E+07	1.00E-06	676	0.4	1689.70	59.7			

Nickel Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual	Concentration	Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	0.4	59.7	28.312	6.76E+02	1.00E-06	6.76E-04	86400	5.84E+01	0.0011	6.42E-02	365	23

Nickel Creek												
	High Yield	High Yield	High Yield	High Yield	Conversion	mg sec	Flow	mg/cubic foot	Concentration			
	Bank Erosion	Bank Erosion	Bank Erosion	Bank Erosion	kg to mg							
					1E-06 or							
	tons/year	tons/day	kg/day	mg/day	0.000001				mg/l			
	387.00	1.1	961.7	9.62E+08	1.00E-06	11130	0.4	27826.06	982.7			

Nickel Creek												
		Load Capacity	Conversion	mg/cubic foot	Conversion	Kg/cf	Conversion	Sediment load	Conversion	Tons per	Number of	Tons/year
	Mean annual		Factor		mg to kg		seconds/day	at kg/day	kg to tons	day	Days/year	
	Discharge		cubic feet to		1E-06 or				1kg =			
	cfs	mg/l	liters		0.000001				0.0011 tons		365	
	0.4	982.7	28.312	1.11E+04	1.00E-06	1.11E-02	86400	9.62E+02	0.0011	1.06E+00	365	386

Table D30 12 Month Discharge Model Castle Creek

Estimated Flows Table
6th Field HUC
17050104 0603 Castle Creek

Area	Area	Mean Basin Elevation	Basin Relief	Slopes >30%		Mean Annual Precip.	Landuse Forested	Basin Slope Average	Distance Total	Distance ^10 & 85%	Elevation Change	Elevation Change ^@10 and 85 %		Main Channel Slope
Acres	Miles	feet	feet	%		in	%	%	miles	miles	meters	feet		ft/miles
15372	24	6400	1664	20		14.6	30	20	11	10		1280		155.15

A=	24	Total						
E=	5.4	Discharge		A	BS	S30	F	Total
BR=	1664	Power		0.963	-3.44	2.52	0.646	Discharge
S30=S+1%=	21			24	20	21	31	cfs
P=	14.6							
F=	31	Qa=	8.37E-01	21.34	0.0000335	2147.79	9.19	11.80
BS=	20							
MCS=	155.2							

Power	MCS	F	P		
June					
Q80	-1.46	0.775	1.21		
Q50	-1.53	0.844	1.65		
Q20	-1.55	0.793	1.9		
June		MCS	F	P	Flow
Q.80=	5.47E+01	0.0006331	14.3155	25.64	12.71
Q.50=	3.59E+01	0.0004448	18.143	83.40	24.16
Q.20=	4.31E+01	0.0004021	15.2282	163.03	43.03

Power	MCS	F	P		
July					
Q80	-1.21	0.587	0.0617		
Q50	-1.36	0.698	0.464		
Q20	-1.55	0.734	0.876		
July		MCS	F	P	Flow
Q.80=	2.66E+02	2.23E-03	7.50636	1.18	5.26
Q.50=	2.43E+02	1.05E-03	10.9893	3.47	9.71
Q.20=	2.85E+02	4.02E-04	12.4354	10.47	14.92

Power	MCS		F		
August					
Q80	-1.03		0.465		
Q50	-1.28		0.57		
Q20	-1.39		0.648		
August			MCS	F	Flow
Q.80=	1.34E+02		5.54E-03	4.93723	3.67
Q.50=	4.80E+02		1.57E-03	7.0807	5.34
Q.20=	9.86E+02		9.01E-04	9.25555	8.22

Standard Error				Flow		Flow	Standard Error			Flow	Flow			Standard Error				Flow	Flow
June				cfs		cfs	July			cfs	cfs			August				cfs	cfs

Q80	143.7%	to	-59.0%	**30.98**		**5.21**	Q80	185.6%	to	-65.0%	**15.03**	**1.84**			Q80	214.8%		to	-68.2%	**11.54**	**1.17**
Q50	165.6%		-62.4%	**64.17**		**39.24**	Q50	155.3%		-60.8%	**24.80**	**3.81**			Q50	195.7%			-66.2%	**15.78**	**1.80**
Q20	167.4%		-62.6%	**115.05**		**69.96**	Q20	140.0%		-58.3%	**35.81**	**6.22**			Q20	163.3%			-62.0%	**21.66**	**3.13**

Power	MCS	F
September		
Q80	-0.992	0.469
Q50	-1.23	0.503
Q20	-1.36	0.547

September		MCS	F	Flow
Q.80=	1.10E+02	0.0067107	5.00551	3.69
Q.50=	3.98E+02	0.0020201	5.62542	4.52
Q.20=	9.48E+02	0.0010485	6.54297	6.50

Power	MCS	F
October		
Q80	-1.09	0.432
Q50	-1.27	0.523
Q20	-1.43	0.598

October		MCS	F	Flow
Q.80=	2.27E+02	4.09E-03	4	4.10
Q.50=	5.77E+02	1.65E-03	6	5.74
Q.20=	1.56E+03	7.37E-04	8	8.96

Power	MCS	F
November		
Q80	-1.26	0.503
Q50	-1.36	0.568
Q20	-1.42	0.594

November		MCS	F	Flow
Q.80=	5.28E+02	1.74E-03	5.62542	5.16
Q.50=	9.89E+02	1.05E-03	7.03224	7.29
Q.20=	1.71E+03	7.75E-04	7.68898	10.19

Standard Error				**Flow**		**Flow**	Standard Error				**Flow**	**Flow**			Standard Error					**Flow**	**Flow**
September				**cfs**		**cfs**	October				**cfs**	**cfs**			November					**cfs**	**cfs**
Q80	204.1%	to	-67.1%	**11.24**		**1.22**	Q80	161.2%	to	-61.7%	**10.70**	**1.57**			Q80	115.9%		to	-53.7%	**11.13**	**2.39**
Q50	192.2%		-65.8%	**13.22**		**1.55**	Q50	137.8%		-58.0%	**13.65**	**2.41**			Q50	99.2%			49.8%	**14.53**	**10.92**
Q20	172.3%		-63%	**17.71**		**2.39**	Q20	103.6%		50.9%	**18.24**	**13.52**			Q20	89.8%			47.3%	**19.33**	**15.00**

Power	MCS	F	P
December			
Q80	-1.26	0.507	
Q50	-1.35	0.565	
Q20	-1.29	0.606	

December	MCS	F	P	Flow

Power	E	S30	MCS	F
January				
Q80	-0.526	0.209	-1.33	0.485
Q50	-1.55	0.468	-1.41	0.548
Q20	-3.85	1.02	-1.49	0.705

January	E	S30	MCS	F	Flow

Power	E	S30	MCS	F
February				
Q80	-1.130	0.488	-1.47	0.47
Q50	-3.06	0.939	-1.53	0.548
Q20	-4.06	1.21	-1.56	0.515

February	E	S30	MCS	F	Flow

Q.80=	5.97E+02	0.0017364	5.70322	1.00		5.91
Q.50=	1.02E+03	0.0011028	6.96016	1.00		7.83
Q.20=	1.14E+03	0.0014925	8.01245	1.00		13.63

Q.80=	1.16E+03	4.12E-01	1.88949	0.001220	5.3	5.82
Q.50=	5.82E+03	7.32E-02	4.15718	0.000815	6.6	9.48
Q.20=	1.27E+05	1.51E-03	22.3184	0.000544	11.3	26.30

Q.80=	3.94E+03		1.49E-01	4.41818	0.000602	5.0	7.83E+00
Q.50=	5.18E+04		5.74E-03	17.4407	0.000445	6.6	1.51E+01
Q.20=	3.05E+05		1.06E-03	39.8002	0.000382	5.9	2.89E+01

Standard Error				**Flow**		**Flow**
December				**cfs**		**cfs**
Q80	91.9%	to	-47.9%	**11.35**		**3.08**
Q50	91.2%		47.7%	**14.97**		**11.56**
Q20	107.0%		51.7%	**28.22**		**20.68**

Standard Error				**Flow**	**Flow**		
January				**cfs**	**cfs**		
Q80	90.9%	to	-47.6%	**11.12**	**2.77**		
Q50	88.4%		-47.7%	**17.86**	**3.43**		
Q20	89.2%		-51.7%	**49.76**	**5.44**		

Standard Error					**Flow**	**Flow**
February					**cfs**	**cfs**
Q80	88.1%		to	-46.8%	**14.72**	**2.67**
Q50	99.7%			-49.9%	**30.24**	**3.29**
Q20	125.4%			-55.6%	**65.18**	**2.60**

Power March	A	E	S30	F
Q80	0.922	-1.75	0.354	0.537
Q50	1	-2.97	0.684	0.546
Q20	1.04	-3.59	0.82	0.470

Power April	BS	S30	MCS	F
Q80	-3.340	2.8	-1.52	0.795
Q50	-2.12	2.01	-1.55	0.746
Q20	-0.607	1.02	-1.57	0.57

Power May	MCS		F	P
Q80	-1.480		0.817	1.9
Q50	-1.49		0.862	2.13
Q20	-1.43		0.699	2.26

March		A	E	S30	F	Flow
Q.80=	4.10E-01	18.73073	5.2E-02	2.94	6.32	7.46
Q.50=	1.58E+00	24.00000	6.7E-03	8.02	6.52	13.25
Q.20=	6.34E+00	27.25334	2.3E-03	12.14	5.02	24.74

April		BS	S30	MCS	F	Flow
Q.80=	1.17E+04	4.51E-05	5037.49	0.000468	15.333	19.15
Q.50=	9.86E+03	1.75E-03	454.633	0.000402	13.0	40.76
Q.20=	7.66E+03	1.62E-01	22.3184	0.000364	7.1	71.41

May			F	P	Flow
Q.80=	1.28E+00	5.72E-04	16.54	163.031	1.98
Q.50=	1.38E+00	5.44E-04	13.23	302.045	3.00
Q.20=	1.91E+00	7.37E-04	33.99	427.994	20.47

Standard Error				**Flow**		**Flow**
March				**cfs**		**cfs**
Q80	131.0%	to	-56.7%	**17.23**		**3.23**
Q50	139.1%		-58.3%	**31.69**		**5.53**
Q20	132.2%		-56.9%	**57.44**		**10.66**

Standard Error				**Flow**	**Flow**		
April				**cfs**	**cfs**		
Q80	110.5%	to	-52.5%	**40.31**	**9.10**		
Q50	139.6%		-58.3%	**97.66**	**17.00**		
Q20	161.5%		61.8%	**186.74**	**115.54**		

Standard Error					**Flow**	**Flow**
May					**cfs**	**cfs**
Q80	151.5%		to	-60.2%	**4.97**	**0.79**
Q50	180.3%			-64.3%	**8.41**	**1.07**
Q20	163.9%			-62.6%	**54.01**	**7.65**

Table D31 12 Month Discharge Model Blue Creek

Estimated Flows
6th Field HUC
Blue Creek Reservoir

Area	Area	Mean Basin Elevation	Basin Relief	Slopes >30%		Mean Annual Precip.	Landuse Forested	Basin Slope Average	Distance Total	Distance ^10 & 85%	Elevation Change	Elevation Change ^@10 and 85 %		Main Channel Slope
Acres	Miles	feet	feet	%		in	%	%	miles	miles	meters	feet		ft/miles
39224	61.3	5760	800	10		15	0	10	20.2	13.8		620		40.92

A=	61.3	Total								
E=	5.4	Discharge		A	BS	S30	F		Total	
BR=	800	Power		0.963	-3.44	2.52	0.646		Discharge	
S30=S+1%=	11			61.3	10	11	1		cfs	
P=	15									
F=	1	Qa=	8.37E-01	52.64	######	421.03	1.00		6.74	
BS=	10									
MCS=	40.9									

Power	MCS	F	P			Power	MCS	F	P		Power	MCS	F
June						July					August		
Q80	-1.46	0.775	1.21			Q80	-1.21	0.587	0.0617		Q80	-1.03	0.465
Q50	-1.53	0.844	1.65			Q50	-1.36	0.698	0.464		Q50	-1.28	0.57
Q20	-1.55	0.793	1.9			Q20	-1.55	0.734	0.876		Q20	-1.39	0.648

June		MCS	F	P	Flow	July		MCS	F	P	Flow	August		MCS	F	Flow
Q.80=	5.47E+01	0.004431	1	26.49	6.42	Q.80=	2.66E+02	1.12E-02	1	1.18	3.52	Q.80=	1.34E+02	2.19E-02	1	2.93
Q.50=	3.59E+01	0.003417	1	87.21	10.70	Q.50=	2.43E+02	6.42E-03	1	3.51	5.48	Q.50=	4.80E+02	8.64E-03	1	4.15
Q.20=	4.31E+	0.003173	1	171.62	23.47	Q.20=	2.85E+02	3.17E-03	1	10.72	9.69	Q.20=	9.86E+02	5.75E-03	1	5.67

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Standard Error				Flow		Flow	Standard Error				Flow	Flow			Standard Error				Flow	Flow
June				cfs		cfs	July				cfs	cfs			August				cfs	cfs
Q80	143.7%	to	-59.0%	**15.65**		**2.63**	Q80	185.6%	to	-65.0%	**10.06**	**1.23**			Q80	214.8%	to	-68.2%	**9.22**	**0.93**
Q50	165.6%		-62.4%	**28.41**		**17.37**	Q50	155.3%		-60.8%	**14.00**	**2.15**			Q50	195.7%		-66.2%	**12.27**	**1.40**
Q20	167.4%		-62.6%	**62.75**		**38.16**	Q20	140.0%		-58.3%	**23.27**	**4.04**			Q20	163.3%		-62.0%	**14.92**	**2.15**

Power	MCS	F			Power	MCS	F			Power	MCS	F		
September					October					November				
Q80	-0.992	0.469			Q80	-1.09	0.432			Q80	-1.26	0.503		
Q50	-1.23	0.503			Q50	-1.27	0.523			Q50	-1.36	0.568		
Q20	-1.36	0.547			Q20	-1.43	0.598			Q20	-1.42	0.594		
September	MCS	F		Flow	October	MCS	F		Flow	November	MCS	F		Flow
Q.80=	1.10E+02	0.025172	1	2.77	Q.80=	2.27E+02	1.75E-02	1	3.97	Q.80=	5.28E+02	9.31E-03	1	4.92
Q.50=	3.98E+02	0.010406	1	4.14	Q.50=	5.77E+02	8.97E-03	1	5.18	Q.50=	9.89E+02	6.42E-03	1	6.35
Q.20=	9.48E+02	0.006423	1	6.09	Q.20=	1.56E+03	4.95E-03	1	7.73	Q.20=	1.71E+03	5.14E-03	1	8.79

Standard Error				Flow		Flow	Standard Error				Flow	Flow			Standard Error				Flow	Flow
September				cfs		cfs	October				cfs	cfs			Novemebr				cfs	cfs
Q80	204.1%	to	-67.1%	**8.42**		**0.91**	Q80	161.2%	to	-61.7%	**10.37**	**1.52**			Q80	115.9%	to	-53.7%	**10.61**	**2.28**
Q50	192.2%		-65.8%	**12.10**		**1.42**	Q50	137.8%		-58.0%	**12.31**	**2.17**			Q50	99.2%		49.8%	**12.65**	**9.52**
Q20	172.3%		-63%	**16.58**		**2.23**	Q20	103.6%		50.9%	**15.73**	**11.66**			Q20	89.8%		47.3%	**16.68**	**12.95**

Power	MCS	F	P	Power	E	S30	MCS	F	Power	E	S30	MCS	F
December				January					February				

Q80	-1.26	0.507
Q50	-1.35	0.565
Q20	-1.29	0.606

Q80	-0.526	0.209	-1.33	0.485
Q50	-1.55	0.468	-1.41	0.548
Q20	-3.85	1.02	-1.49	0.705

Q80	-1.130	0.488	-1.47	0.47
Q50	-3.06	0.939	-1.53	0.548
Q20	-4.06	1.21	-1.56	0.515

December		MCS	F	P	Flow
Q.80=	5.97E+02	0.009309	1	1.00	5.56
Q.50=	1.02E+03	0.006665	1	1.00	6.80
Q.20=	1.14E+03	0.008328	1	1.00	9.49

January		E	S30	MCS	F	Flow
Q.80=	1.16E+03	4.12E-01	1.650635	0.007179	1.0	5.66
Q.50=	5.82E+03	7.32E-02	3.07165	0.005335	1.0	6.99
Q.20=	1.27E+05	1.51E-03	11.54039	0.003964	1.0	8.80

February		E	S30	MCS	F
Q.80=	3.94E+03	1.49E-01	3.22255	0.004270	1.0
Q.50=	5.18E+04	5.74E-03	9.503153	0.003417	1.0
Q.20=	3.05E+05	1.06E-03	18.20058	0.003057	1.0

Standard Error				Flow		Flow
December				cfs		cfs
Q80	91.9%	to	-47.9%	10.66		2.90
Q50	91.2%		-47.7%	13.00		3.56
Q20	107.0%		-51.7%	19.65		4.59

Standard Error				Flow	Flow		
January				cfs	cfs		
Q80	90.9%	to	-47.6%	10.81	0.52		
Q50	88.4%		-47.7%	13.16	0.52		
Q20	89.2%		-51.7%	16.65	0.48		

Standard Error				Flow	Flow
February				cfs	cfs
Q80	88.1%	to	-46.8%	15.17	0.53
Q50	99.7%		-49.9%	19.28	0.50
Q20	125.4%		-55.6%	40.66	0.44

Power March	A	E	S30	F
Q80	0.922	-1.75	0.354	0.537
Q50	1	-2.97	0.684	0.546
Q20	1.04	-3.59	0.82	0.470

Power April	BS	S30	MCS	F
Q80	-3.340	2.8	-1.52	0.795
Q50	-2.12	2.01	-1.55	0.746
Q20	-0.607	1.02	-1.57	0.57

Power May	MCS	F	P
Q80	-1.480	0.817	1.9
Q50	-1.49	0.862	2.13
Q20	-1.43	0.699	2.26

June		A	E	S30	F	Flow
Q.80=	4.10E-01	44.46707	5.2E-02	2.34	1.00	2.23
Q.50=	1.58E+00	61.30000	6.7E-03	5.16	1.00	3.34
Q.20=	6.34E+00	72.27014	2.3E-03	7.14	1.00	7.69

April		BS	S30	MCS	F	Flow
Q.80=	1.17E+04	4.57E-04	823.9475	0.003546	1.0	15.68
Q.50=	9.86E+03	7.59E-03	123.9365	0.003173	1.0	29.41
Q.20=	7.66E+03	2.47E-01	11.54039	0.002946	1.0	64.36

July		F	P	Flow
Q.80=	1.28E+00	1	9.138324	11.70
Q.50=	1.38E+00	1	10.32264	14.25
Q.20=	1.91E+00	1	6.638773	12.68

Standard Error			Flow		Flow	Standard Error			Flow	Flow			Standard Error			Flow	Flow

March				cfs		cfs	April				cfs	cfs			May				cfs	cfs
Q80	131.0%	to	-56.7%	**5.15**		**0.96**	Q80	110.5%	to	-52.5%	**33.01**	**7.45**			Q80	151.5%	to	-60.2%	**29.42**	**4.66**
Q50	139.1%		-58.3%	**7.98**		**1.39**	Q50	139.6%		-58.3%	**70.47**	**12.26**			Q50	180.3%		-64.3%	**39.93**	**5.09**
Q20	132.2%		-56.9%	**17.85**		**3.31**	Q20	161.5%		61.8%	**168.31**	**104.14**			Q20	163.9%		-62.6%	**33.46**	**4.74**

Table D32 12 Month Discharge Model Juniper Creek

Estimated Flows
6th Field HUC
170501 040603 Juniper Basin

Area	Area	Mean Basin Elevation	Basin Relief	Slopes >30%		Mean Annual Precip.	Landuse Forested	Basin Slope Average	Distance Total	Distance ^10 & 85%	Elevation Change	Elevation Change ^@10 and 85 %		Main Channel Slope
Acres	Miles	feet	feet	%		in	%	%	miles	miles	meters	feet		ft/miles
53051	82.9	5400	400	5		14.6	0	10	12.9	10.6		482		49.82

A=	82.9	Total Discharge Power		A	BS	S30	F		Total Discharge cfs
E=	5.4								
BR=	400			0.963	-3.44	2.52	0.646		
S30=S+1%=	6			82.9	10	6	1		
P=	14.6								
F=	1	Qa=	8.37E-01	70.40	0.0003631	91.40	1.00		1.96
BS=	10								
MCS=	49.8								

Power June	MCS	F	P
Q80	-1.46	0.775	1.21
Q50	-1.53	0.844	1.65
Q20	-1.55	0.793	1.9

June		MCS	F	P	Flow
Q.80=	5.47E+01	0.003325077	1	25.64	4.66
Q.50=	3.59E+01	0.002529205	1	83.40	7.57
Q.20=	4.31E+01	0.002339032	1	163.03	16.44

Power July	MCS	F	P
Q80	-1.21	0.587	0.0617
Q50	-1.36	0.698	0.464
Q20	-1.55	0.734	0.876

July		MCS	F	P	Flow
Q.80=	2.66E+02	8.83E-03	1	1.18	2.77
Q.50=	2.43E+02	4.92E-03	1	3.47	4.14
Q.20=	2.85E+02	2.34E-03	1	10.47	6.98

Power August	MCS	F
Q80	-1.03	0.465
Q50	-1.28	0.57
Q20	-1.39	0.648

August		MCS	F	Flow
Q.80=	1.34E+02	1.79E-02	1	2.39
Q.50=	4.80E+02	6.72E-03	1	3.23
Q.20=	9.86E+02	4.37E-03	1	4.31

Standard Error				Flow		Flow
June				cfs		cfs
Q80	143.7%	to	-59.0%	**11.36**		**1.91**
Q50	165.6%		-62.4%	**20.11**		**12.30**
Q20	167.4%		-62.6%	**43.95**		**26.72**

Standard Error				Flow	Flow
July				cfs	cfs
Q80	185.6%	to	-65.0%	**7.92**	**0.97**
Q50	155.3%		-60.8%	**10.58**	**1.62**
Q20	140.0%		-58.3%	**16.75**	**2.91**

Standard Error				Flow	Flow
August				cfs	cfs
Q80	214.8%	to	-68.2%	**7.53**	**0.76**
Q50	195.7%		-66.2%	**9.54**	**1.09**
Q20	163.3%		-62.0%	**11.35**	**1.64**

Power September	MCS	F
Q80	-0.992	0.469
Q50	-1.23	0.503
Q20	-1.36	0.547

September		MCS	F	Flow
Q.80=	1.10E+02	0.020710143	1	2.28
Q.50=	3.98E+02	0.008169639	1	3.25
Q.20=	9.48E+02	0.004915202	1	4.66

Standard Error			Flow		Flow
September			cfs		cfs
Q80	204.1%	to	-67.1%	**6.93**		**0.75**
Q50	192.2%		-65.8%	**9.50**		**1.11**
Q20	172.3%		-63%	**12.69**		**1.71**

Power October	MCS	F
Q80	-1.09	0.432
Q50	-1.27	0.523
Q20	-1.43	0.598

October		MCS	F	Flow
Q.80=	2.27E+02	1.41E-02	1	3.21
Q.50=	5.77E+02	6.99E-03	1	4.03
Q.20=	1.56E+03	3.74E-03	1	5.83

Standard Error				Flow	Flow
October				cfs	cfs
Q80	161.2%	to	-61.7%	**8.37**	**1.23**
Q50	137.8%		-58.0%	**9.59**	**1.69**
Q20	103.6%		50.9%	**11.87**	**8.80**

Power November	MCS	F
Q80	-1.26	0.503
Q50	-1.36	0.568
Q20	-1.42	0.594

November		MCS	F	Flow
Q.80=	5.28E+02	7.27E-03	1	3.84
Q.50=	9.89E+02	4.92E-03	1	4.86
Q.20=	1.71E+03	3.89E-03	1	6.65

Standard Error				Flow	Flow
Novemebr				cfs	cfs
Q80	115.9%	to	-53.7%	**8.28**	**1.78**
Q50	99.2%		49.8%	**9.68**	**7.28**
Q20	89.8%		47.3%	**12.62**	**9.79**

Power December	MCS	F	P
Q80	-1.26	0.507	
Q50	-1.35	0.565	
Q20	-1.29	0.606	

December		MCS	F	P	Flow
Q.80=	5.97E+02	0.007265759	1	1.00	4.34
Q.50=	1.02E+03	0.005111111	1	1.00	5.21
Q.20=	1.14E+03	0.006461883	1	1.00	7.37

Standard Error			Flow		Flow
December			cfs		cfs
Q80	91.9%	to	-47.9%	**8.32**		**2.26**
Q50	91.2%		47.7%	**9.97**		**7.70**
Q20	107.0%		51.7%	**15.25**		**11.18**

Power January	E	S30	MCS	F
Q80	-0.526	0.209	-1.33	0.485
Q50	-1.55	0.468	-1.41	0.548
Q20	-3.85	1.02	-1.49	0.705

January		E	S30	MCS	F	Flow
Q.80=	1.16E+03	4.12E-01	1.45423171	0.005527	1.0	3.84
Q.50=	5.82E+03	7.32E-02	2.31299549	0.004043	1.0	3.99
Q.20=	1.27E+05	1.51E-03	6.21891005	0.002957	1.0	3.54

Standard Error				Flow	Flow
January				cfs	cfs
Q80	90.9%	to	-47.6%	**7.33**	**0.52**
Q50	88.4%		-47.7%	**7.51**	**0.52**
Q20	89.2%		-51.7%	**6.69**	**0.48**

Power February	E	S30	MCS	F
Q80	-1.130	0.488	-1.47	0.47
Q50	-3.06	0.939	-1.53	0.548
Q20	-4.06	1.21	-1.56	0.515

February		E	S30	MCS	F	Flow
Q.80=	3.94E+03	1.49E-01	2.39738515	0.003198	1.0	4.49E+00
Q.50=	5.18E+04	5.74E-03	5.37878301	0.002529	1.0	4.04E+00
Q.20=	3.05E+05	1.06E-03	8.74103809	0.002249	1.0	6.37E+00

Standard Error				Flow	Flow
February				cfs	cfs
Q80	88.1%	to	-46.8%	**8.45**	**0.53**
Q50	99.7%		-49.9%	**8.08**	**0.50**
Q20	125.4%		-55.6%	**14.37**	**0.44**

Power	A	E	S30	F

Power	BS	S30	MCS	F

Power	MCS	F	P

March				
Q80	0.922	-1.75	0.354	0.537
Q50	1	-2.97	0.684	0.546
Q20	1.04	-3.59	0.82	0.470

April				
Q80	-3.340	2.8	-1.52	0.795
Q50	-2.12	2.01	-1.55	0.746
Q20	-0.607	1.02	-1.57	0.57

May			
Q80	-1.480	0.817	1.9
Q50	-1.49	0.862	2.13
Q20	-1.43	0.699	2.26

June		A	E	S30	F	Flow
Q.80=	4.10E-01	58.73639	5.2E-02	1.89	1.00	2.37
Q.50=	1.58E+00	82.90000	6.7E-03	3.41	1.00	2.98
Q.20=	6.34E+00	98.92287	2.3E-03	4.35	1.00	6.40

April		BS	S30	MCS	F	Flow
Q.80=	1.17E+04	4.57E-04	150.946658	0.002630	1.0	2.13
Q.50=	9.86E+03	7.59E-03	36.6508468	0.002339	1.0	6.41
Q.20=	7.66E+03	2.47E-01	6.21891005	0.002163	1.0	25.47

July		F	P	Flow
Q.80=	1.28E+00	1	8.93873955	11.44
Q.50=	1.38E+00	1	10.0849131	13.92
Q.20=	1.91E+00	1	6.51452337	12.44

Standard Error				**Flow**		**Flow**
March				**cfs**		**cfs**
Q80	131.0%	to	-56.7%	**5.48**		**1.03**
Q50	139.1%		-58.3%	**7.13**		**1.24**
Q20	132.2%		-56.9%	**14.86**		**2.76**

Standard Error				**Flow**	**Flow**		
April				**cfs**	**cfs**		
Q80	110.5%	to	-52.5%	**4.48**	**1.01**		
Q50	139.6%		-58.3%	**15.36**	**2.67**		
Q20	161.5%		61.8%	**66.60**	**41.21**		

Standard Error				**Flow**	**Flow**
May				**cfs**	**cfs**
Q80	151.5%	to	-60.2%	**28.78**	**4.55**
Q50	180.3%		-64.3%	**39.01**	**4.97**
Q20	163.9%		-62.6%	**32.84**	**4.65**

Table D33 12 Month Discharge Model Deep Creek

Estimated Flows
6th Field HUC
170501 Deep Creek
040603

Area	Area	Mean Basin Elevation	Basin Relief	Slopes >30%		Mean Annual Precip.	Landuse Forested	Basin Slope Average	Distance Total	Distance ^10 & 85%	Elevation Change	Elevation Change ^@10 and 85 %		Main Channel Slope
Acres	Miles	feet	feet	%		in	%	%	miles	miles	meters	feet		ft/miles
273563	427	5526	1920	10		14.9	29	18	38.1	27.3		912		31.92

A=	427	Total Discharge Power		A	BS	S30	F	Total Discharge cfs
E=	5.4			0.963	-3.44	2.52	0.646	
BR=	1920			427	18	11	30	
S30=S+1%=	11							
P=	14.9							
F=	30	Qa=	8.37E-01	341.27	0.0000481	421.03	9.00	52.03
BS=	18							
MCS=	31.9							

Power June	MCS	F	P	Power July	MCS	F	P	Power August	MCS	F
Q80	-1.46	0.775	1.21	Q80	-1.21	0.587	0.0617	Q80	-1.03	0.465
Q50	-1.53	0.844	1.65	Q50	-1.36	0.698	0.464	Q50	-1.28	0.57
Q20	-1.55	0.793	1.9	Q20	-1.55	0.734	0.876	Q20	-1.39	0.648

June		MCS	F	P	Flow	July		MCS	F	P	Flow	August		MCS	F	Flow
Q.80=	5.47E+01	0.006370118	13.956257	26.28	127.78	Q.80=	2.66E+02	1.51E-02	7.3632607	1.18	35.03	Q.80=	1.34E+02	2.82E-02	4.8625198	18.4
Q.50=	3.59E+01	0.004998812	17.64779	86.25	273.15	Q.50=	2.43E+02	9.01E-03	10.740652	3.50	82.33	Q.50=	4.80E+02	1.19E-02	6.9495889	39.6
Q.20=	4.31E+01	0.004664302	14.837378	169.45	505.45	Q.20=	2.85E+02	4.66E-03	12.139673	10.66	172.01	Q.20=	9.86E+02	8.12E-03	9.0609675	72.5

Standard Error June				Flow cfs	Flow cfs	Standard Error July				Flow cfs	Flow cfs	Standard Error August				Flow cfs	Flow cfs
Q80	143.7%	to	-59.0%	**311.40**	**52.39**	Q80	185.6%	to	-65.0%	**100.06**	**12.26**	Q80	214.8%	to	-68.2%	**57.93**	**5.85**
Q50	165.6%		-62.4%	**725.50**	**443.60**	Q50	155.3%		-60.8%	**210.18**	**32.27**	Q50	195.7%		-66.2%	**117.20**	**13.4**
Q20	167.4%		-62.6%	**1351.56**	**821.86**	Q20	140.0%		-58.3%	**412.82**	**71.73**	Q20	163.3%		-62.0%	**190.95**	**27.5**

Power September	MCS	F	Power October	MCS	F	Power November	MCS	F
Q80	-0.992	0.469	Q80	-1.09	0.432	Q80	-1.26	0.503

Q50	-1.23	0.503
Q20	-1.36	0.547

Q50	-1.27	0.523
Q20	-1.43	0.598

Q50	-1.36	0.568
Q20	-1.42	0.594

September		MCS	F	Flow
Q.80=	1.10E+02	0.032212429	4.9291254	17.47
Q.50=	3.98E+02	0.014127634	5.533399	31.11
Q.20=	9.48E+02	0.009006339	6.42666	54.87

October		MCS	F	Flow
Q.80=	2.27E+02	2.29E-02	4	22.63
Q.50=	5.77E+02	1.23E-02	6	42.04
Q.20=	1.56E+03	7.07E-03	8	84.28

November		MCS	F	Flow
Q.80=	5.28E+02	1.27E-02	5.533399	37.2
Q.50=	9.89E+02	9.01E-03	6.9024755	61.4
Q.20=	1.71E+03	7.32E-03	7.5406716	94.3

Standard Error				Flow		Flow
September				cfs		cfs
Q80	204.1%	to	-67.1%	**53.11**		**5.75**
Q50	192.2%		-65.8%	**90.91**		**10.64**
Q20	172.3%		-63%	**149.41**		**20.14**

Standard Error				Flow	Flow
October				cfs	cfs
Q80	161.2%	to	-61.7%	**59.12**	**8.67**
Q50	137.8%		-58.0%	**99.96**	**17.66**
Q20	103.6%		50.9%	**171.59**	**127.17**

Standard Error				Flow	Flow
Novemebr				cfs	cfs
Q80	115.9%	to	-53.7%	**80.32**	**17.2**
Q50	99.2%		49.8%	**122.47**	**92.1**
Q20	89.8%		47.3%	**179.06**	**138.9**

Power	MCS	F	P
December			
Q80	-1.26	0.507	
Q50	-1.35	0.565	
Q20	-1.29	0.606	

Power	E	S30	MCS	F
January				
Q80	-0.526	0.209	-1.33	0.485
Q50	-1.55	0.468	-1.41	0.548
Q20	-3.85	1.02	-1.49	0.705

Power	E	S30	MCS	F
February				
Q80	-1.130	0.488	-1.47	0.47
Q50	-3.06	0.939	-1.53	0.548
Q20	-4.06	1.21	-1.56	0.515

December		MCS	F	P	Flow
Q.80=	5.97E+02	0.01273354	5.6091942	1.00	42.64
Q.50=	1.02E+03	0.009323702	6.8324035	1.00	64.98
Q.20=	1.14E+03	0.011477014	7.8548063	1.00	102.77

January		E	S30	MCS	F	Flow
Q.80=	1.16E+03	4.12E-01	1.6506351	0.009992	5.2	41.01
Q.50=	5.82E+03	7.32E-02	3.0716503	0.007574	6.4	63.96
Q.20=	1.27E+05	1.51E-03	11.540391	0.005742	11.0	140.19

February		E	S30	MCS	F	F
Q.80=	3.94E+03	1.49E-01	3.2225497	0.006153	4.9	
Q.50=	5.18E+04	5.74E-03	9.5031532	0.004999	6.4	
Q.20=	3.05E+05	1.06E-03	18.200577	0.004506	5.8	

Standard Error				Flow		Flow
December				cfs		cfs
Q80	91.9%	to	-47.9%	**81.83**		**22.22**
Q50	91.2%		47.7%	**124.24**		**95.97**
Q20	107.0%		51.7%	**212.74**		**155.90**

Standard Error				Flow	Flow
January				cfs	cfs
Q80	90.9%	to	-47.6%	**78.30**	**2.73**
Q50	88.4%		-47.7%	**120.50**	**3.37**
Q20	89.2%		-51.7%	**265.23**	**5.31**

Standard Error				Flow	Flow
February				cfs	cfs
Q80	88.1%	to	-46.8%	**108.10**	**2.63**
Q50	99.7%		-49.9%	**181.88**	**3.23**
Q20	125.4%		-55.6%	**345.37**	**2.56**

Power	A	E	S30	F
March				
Q80	0.922	-1.75	0.354	0.537
Q50	1	-2.97	0.684	0.546
Q20	1.04	-3.59	0.82	0.470

Power	BS	S30	MCS	F
April				
Q80	-3.340	2.8	-1.52	0.795
Q50	-2.12	2.01	-1.55	0.746
Q20	-0.607	1.02	-1.57	0.57

Power	MCS	F	P
May			
Q80	-1.480	0.817	1.9
Q50	-1.49	0.862	2.13
Q20	-1.43	0.699	2.26

March		A	E	S30	F	Flow
Q.80=	4.10E-01	266.22847	5.2E-02	2.34	6.21	82.84
Q.50=	1.58E+00	427.00000	6.7E-03	5.16	6.40	148.83

April		BS	S30	MCS	F	Flow
Q.80=	1.17E+04	6.42E-05	823.94746	0.005175	14.939	47.99
Q.50=	9.86E+03	2.18E-03	123.93652	0.004664	12.6	157.26

May		MCS	F	P	Flow
Q.80=	1.28E+01	5.94E-03	1	9.0885203	116.33
Q.50=	1.38E+01	5.74E-03	1	10.263289	141.63

Q.20=	6.34E+00	544.05774	2.3E-03	7.14	4.95	286.17
Standard Error				Flow		Flow
March				cfs		cfs
Q80	131.0%	to	-56.7%	**191.35**		**35.87**
Q50	139.1%		-58.3%	**355.86**		**62.06**
Q20	132.2%		-56.9%	**664.50**		**123.34**

Q.20=	7.66E+03	1.73E-01	11.540391	0.004352	6.9	462.56		
Standard Error				Flow	Flow			
April				cfs	cfs			
Q80	110.5%	to	-52.5%	**101.02**	**22.80**			
Q50	139.6%		-58.3%	**376.79**	**65.58**			
Q20	161.5%		61.8%	**1209.58**	**748.42**			

Q.20=	1.91E+01	7.07E-03	1	6.6078047	126.21	
Standard Error					Flow	Flow
May					cfs	cfs
Q80	151.5%		to	-60.2%	**292.58**	**46.3**
Q50	180.3%			-64.3%	**397.00**	**50.5**
Q20	163.9%			-62.6%	**333.07**	**47.2**